ENGINEERING AND MINING JOURNAL

A McGRAW-HILL PUBLICATION

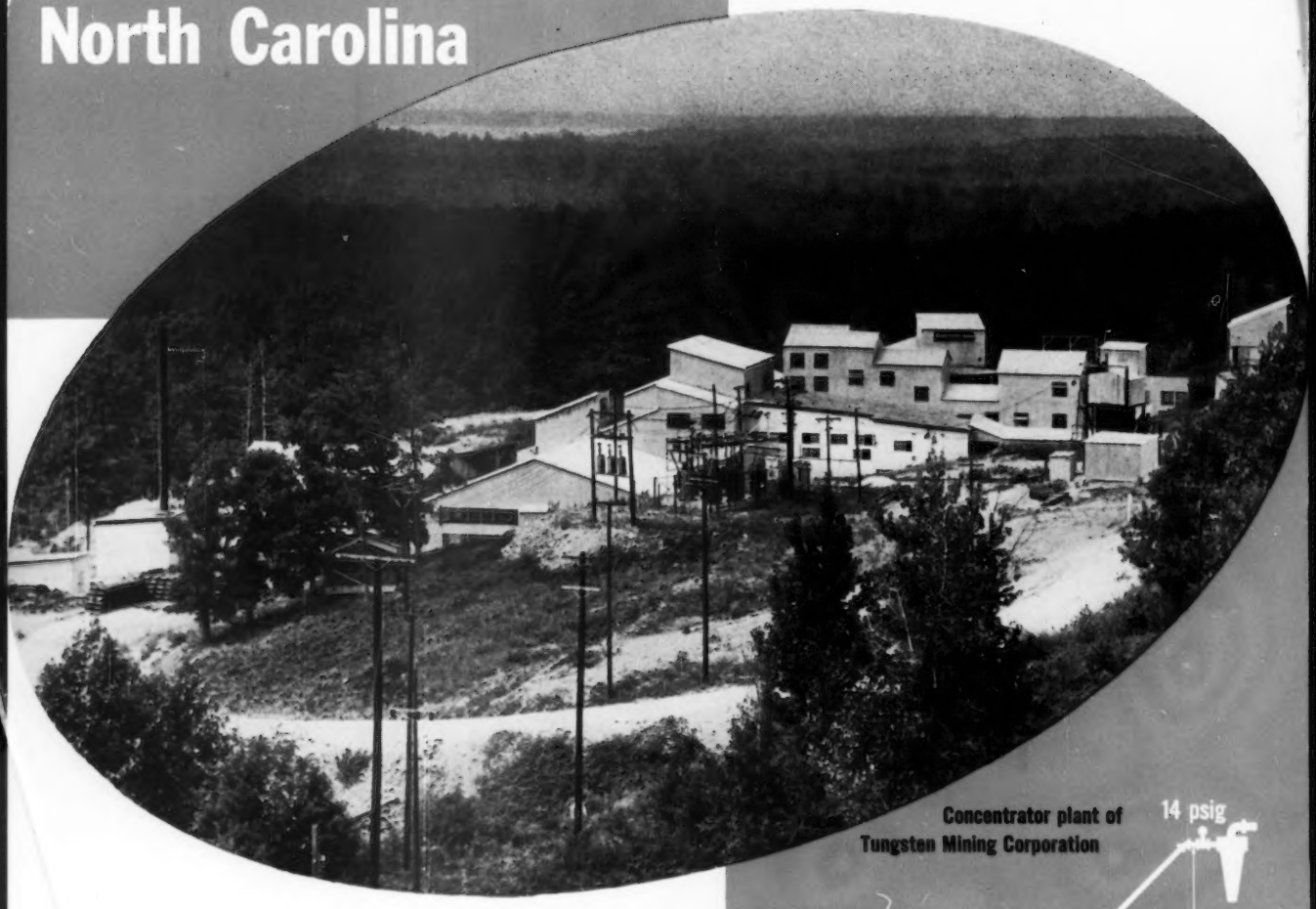
JULY 1958

PRICE ONE DOLLAR

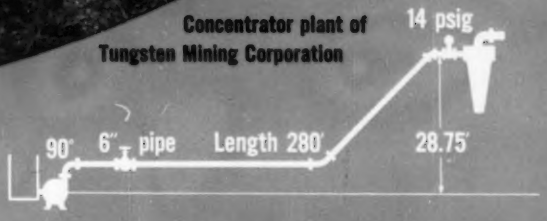
FOUNDED 1866

Ambrosia Lake, N.M.— $81-Million Is Going In

Pump performance in North Carolina



Concentrator plant of Tungsten Mining Corporation

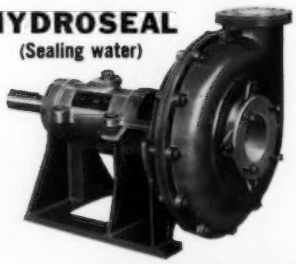


Tungsten Mining Corporation gets good service from the A-S-H pumps at its mine in Henderson, North Carolina. For example, a Hydroseal Slurry pump, installed in the summer of 1956 on cyclone feed, has pumped 164,190 tons of coarse quartz tailings – and the original rubber impeller is still taking the gaff! This pump delivers 1075 GPM containing 12% solids against a total dynamic head of 73 feet. If you like efficiency with economy, write us about your pumping problems.

THE ALLEN-SHERMAN-HOFF PUMP CO.
Dept. B—259 E. Lancaster Ave., Wynnewood, Pa.
Representatives throughout the World

INTERCHANGEABLE
Rubber-lined Pumps

HYDROSEAL
(Sealing water)

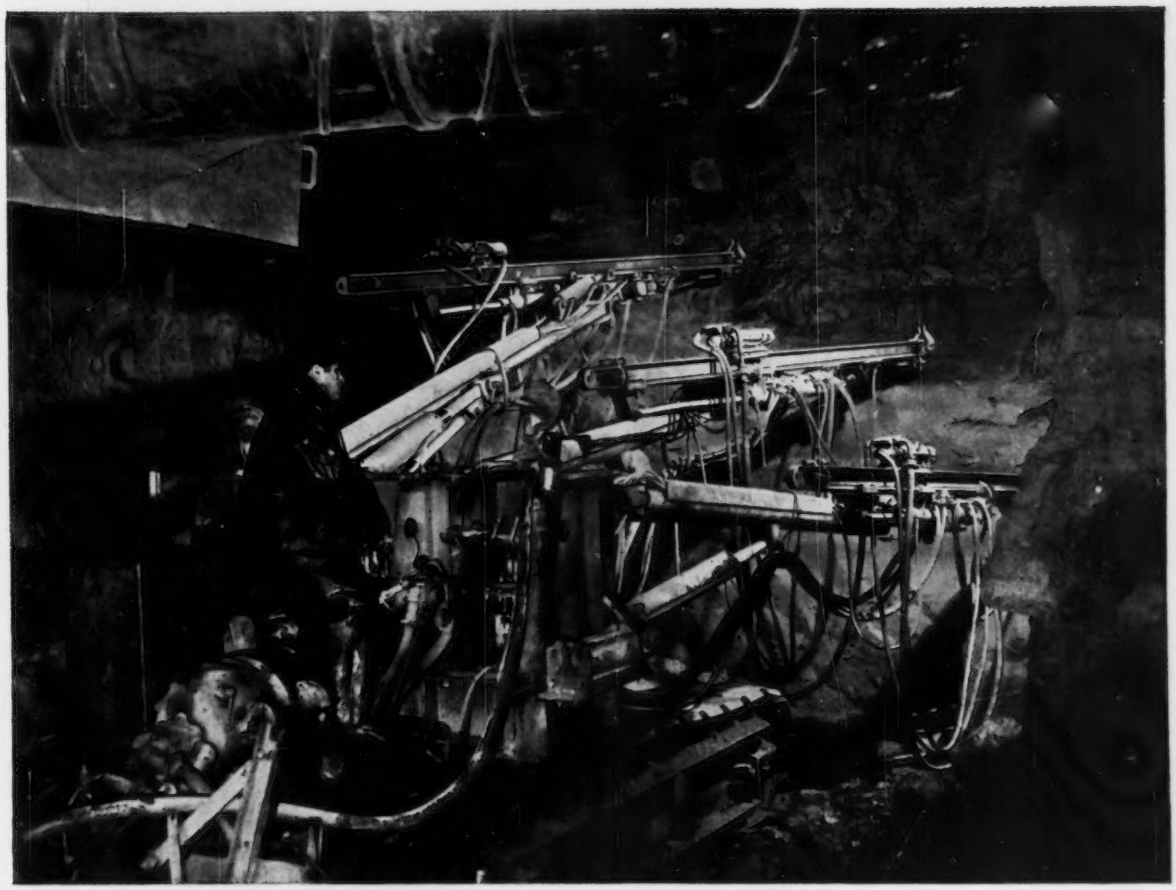


CENTRISEAL
(No sealing water)

HYDROSEAL and CENTRISEAL

SAND, SLURRY & DREDGE PUMPS

MAXIMIX RUBBER PROTECTED



With this Ingersoll-Rand

HYDRA-BOOM MINE JUMBO

one operator can set up 3 drills in 3 minutes!

Time-wasting, muscle-straining manual setups are out when a Hydra-Boom jumbo moves in on air-powered crawlers and heavy-duty drifters are spotted on the face by smooth, powerful, fast-acting hydraulically operated booms. The touch of a throttle, raises, lowers, extends, retracts, pivots, dumps and swings each drill into position in a matter of seconds. Setup time is converted into drilling time.

This compact, three-drill unit is just one example of the many jumbo combinations available with I-R Hydra-Boom mounted drills. Units of any size and number of drills can be supplied to meet every mining requirement to best advantage. Hydra-Boom features include heavier seamless steel booms and bigger double-acting cylinders that move faster, hold better and eliminate creeping or settling.

For the fastest in setups and the easiest operating mine jumbo you ever saw, look into the advantages of I-R Hydra-Booms. Ask your Ingersoll-Rand man for complete information, or send for a copy of new Bulletin No. 4196.

5-853

Ingersoll-Rand

11 Broadway, New York 4, N.Y.

A Constant Standard of Quality in Everything You Need For Drilling Rock

ENGINEERING AND MINING JOURNAL

92nd YEAR OF PUBLICATION

JULY 1958

VOL. 159 NO. 7

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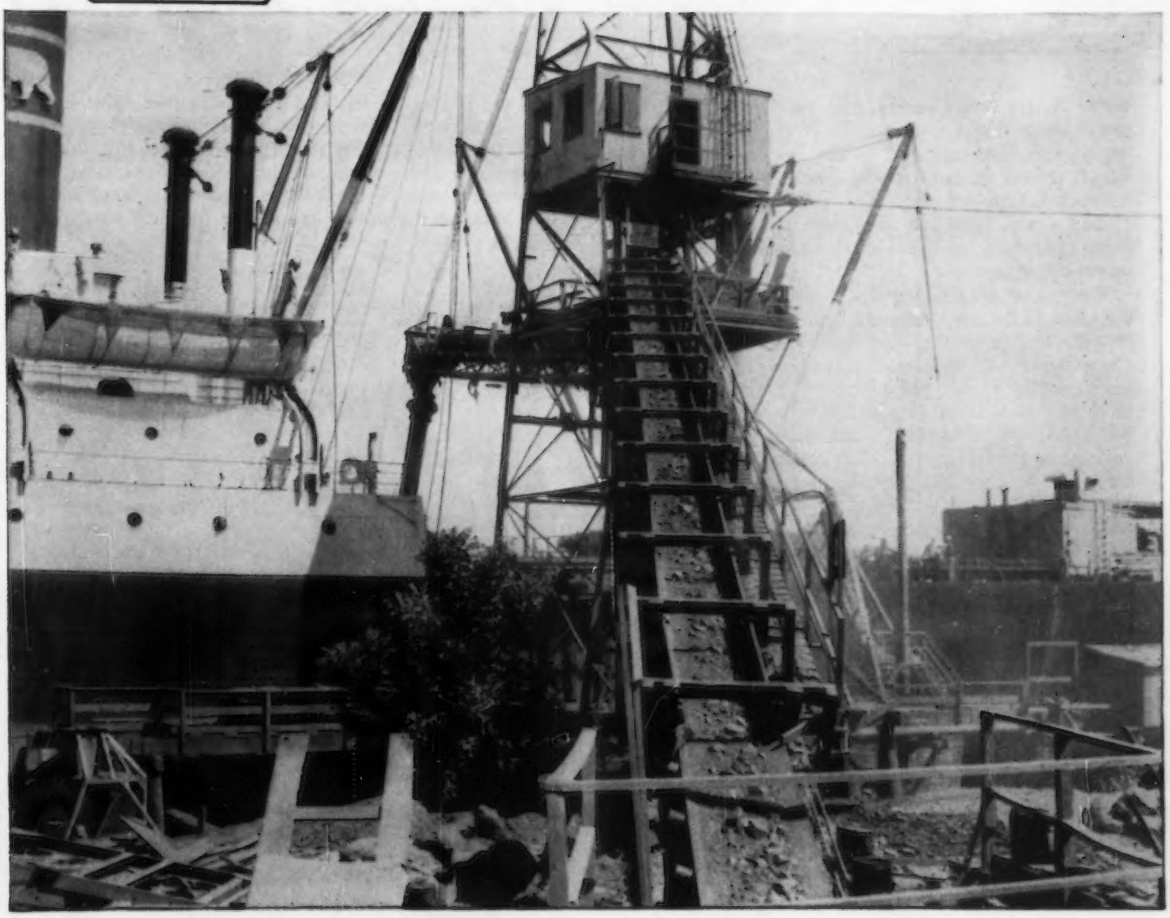
B.F.Goodrich



Iron rushed to sea on a rubber gangplank

B. F. Goodrich improvements in rubber brought extra savings

Problem: That's iron ore being loaded aboard an ocean-going freighter at a 1000-ton-an-hour clip. It costs about $3600 a day to operate a ship like this, so every minute saved in port is vital. The four conveyor belts that haul the ore from railroad cars to ship must keep moving. Stop to repair a belt, and loading would take hours longer while the freighter waited.

What was done: To stand the abuse of heavy chunky loads, sharp cutting edges, crushing impact, engineers recommended B. F. Goodrich Nyfil cord belts. This conveyor belt is made with hundreds of cords, running lengthwise, buried in the rubber. To this is added several layers of Nyfil fabric which gives extra strength to the belt without making it heavy and bulky.

Savings: Trouble-free performance of the B.F.Goodrich conveyor belts has helped make this port the biggest, fastest and most efficient bulk-handling facility on the West Coast. After handling a million tons of material in the first year, the belts showed little sign of wear.

Where to buy: Your B.F.Goodrich distributor has exact specifications for the B.F.Goodrich Nyfil cord belts described here. And, as a factory-trained specialist in rubber products, he can answer your questions about *all* the rubber products B.F.Goodrich makes for industry. *B.F.Goodrich Industrial Products Company, Department M-378, Akron 18, Ohio.*

B.F.Goodrich industrial products

Behind the By-Lines...

We're in the 20th Century, and we like it! In April we found ourselves in a discussion of the Universe, not of the planets and stars, but of the ion and electron. Last month it was bacteria in the leaching tanks. And now it's rockets and jets.

And again, with our own perverse nature, we aren't using power to go aloft, but to get deeper, faster and more efficiently.

The use of jet piercing rigs to drill taconites has been discussed in industry literature before. But on p 103 you'll find the first detailed description of the flame piercer, its components and uses.

One of the things that got us off on the story was the news that flame piercing is far from confined to Iron Range activity. The article will also give you the word on syenite, sandstone and other drilling operations where the new rigs are proving themselves on the balance sheets as well as in the field.

After years of work and patient development, the Ambrosia Lake district of New Mexico is beginning to turn up new mines and mills with a highly satisfactory frequency. All of which goes to say that, in a time when other mining areas are feeling a pinch, uranium north of Grants is booming. See p 86.

A total of $81-million is going into the various shafts and plants of Ambrosia and there are new mining and extraction techniques popping up behind every mesa.

In fact, some of the local lads seem to feel that a whole new attitude toward mining and mining equipment will be a product of the area's ventures, along with an increase of 7,000 tons capacity.

Had we but space enough, and time, we could put out another complete magazine, devoted exclusively to the wonderful reminiscences of mining men. One of the hardest jobs we have around here is turning down some story or other about a mining camp and the fascinating people who inhabited it.

But now and then we get one that's just too good to keep to ourselves. For interest, excitement and a visit with one of the most enjoyable people in the business, we direct you to p 95 and Fred Searls' story about his excursion to the land of The Wild Wa's.

(Incidentally, we must apologize to you and Mr. Searls for our spelling in the title. The first time we sent it to the printer, it read, "The Wild Was." —And he teletyped back, "The wild was what?" Two or three other people in the shop had offered the same complaint so we tossed our grammar book away, remembered the inexplicable apostrophes that keep turning up in Oriental literature, and stuck our elevated comma between the Wa and the s. It may be the coward's way out, but it is a way out.)

The Kawas (no apostrophe needed) were a tribe which claimed some land in South China. Not only did they claim it, they made the claim stick by a uniquely persuasive "gift" to any and all interlopers.

The gift was a piece of amateur, but highly significant handicraft. Should you interlope, a delegation of Kawas dropped in and left a notched stick, with parts and attachments. Said p's and a's consisting of a piece of charcoal (representing death and destruction), a piece of red pepper (anger) and a bird's feather. (The latter is apparently an Oriental version of the post-WW2 phrase to "take off like a big bird".) In case you still didn't get the import, one of the visiting firemen would start reciting the names of the villages who would send warriors to back up the order, one village for each notch in the stick!

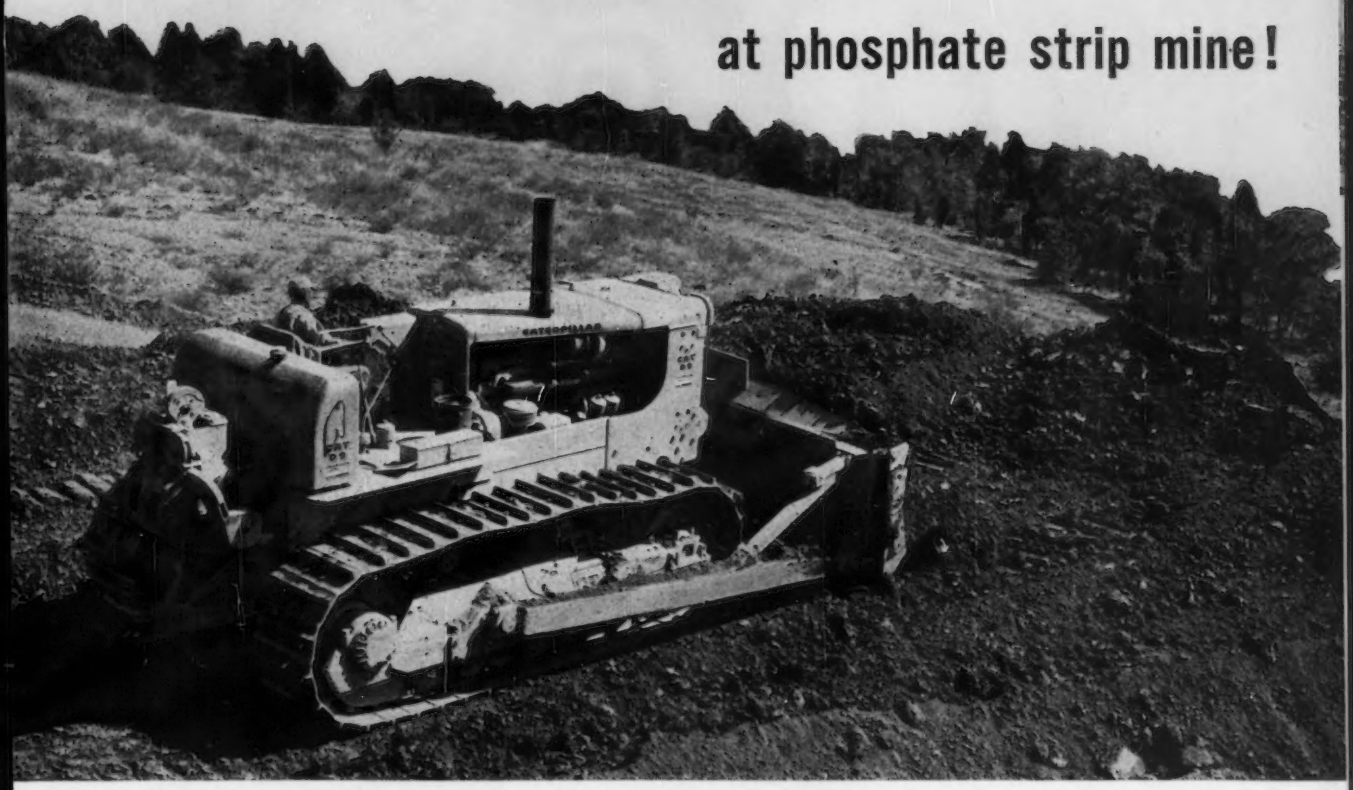
If the names Appomattox, Spotsylvania, Island Ten and "The Cornfield" leave you unmoved, then you are probably very happy, adjusted, and your family is allowed to vacation near streams and mountains instead of guides and monuments.

But if they do mean more than just history, you're a "Civil War Buff," and lost forever to tame fictional accounts of adventure and battle. And of course you have been bitten by the Gettysburg bug, and yearn to read more of Little Round Top, Seminary Ridge and Cemetary Ridge, and what Longstreet (or Lee, or Meade, or Sickles) should have done or didn't do.

There's a palliative for the latter illness. A colorful, on-the-spot relief map of Gettysburg on those early days of July 1863. Aero Service Corp., of Philadelphia makes it. —And it's awfully handy for that split second when the small fry turn away from the Idiot Box and resignedly say, "Tell us again about The War, Dad."

D9 DOZES 4,000 CU. YD. OF OVERBURDEN PER 10-HOUR DAY

at phosphate strip mine!



Here's the remarkable record being made by this giant CAT* D9 Tractor with No. 9S Bulldozer on a phosphate strip mine near Columbia, Tennessee:

—Averages 16 cu. yd. per 150-ft. pass dozing overburden to spoil bank.

—Makes 25 passes per hour, working a 10-hour day.

—*Total: 4,000 cu. yd. of overburden moved daily.*

And this king-sized production output is not the whole story. The D9 benches for a 3-yd. Lima dragline—working ahead maintaining a 15 to 18-ft. shelf for dragline footing.

No wonder Malcolm C. West, owner of the mining contracting firm on this operation, says: "You need a volume of overburden to make a profit—and I think the D9 is the only dozer capable of doing the job."

That's the story at mine after mine. When the D9 goes into action, owners wonder how they ever got along without it! Dozing, the D9 can sometimes outwork 2 bulldozers of the next smaller size. With its massive weight and 320 HP at the flywheel, the D9 digs in and pushes bigger loads faster than many new users had believed possible.

Your Caterpillar Dealer is ready to show *you* on your job exactly how the Caterpillar D9 Tractor can give you high production at low cost per yard. And he's ready, too, to stand behind the long life of this dependable machine with prompt, reliable service and parts you can trust.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

WANTED—
THE HARD WORK

For more than twenty-five years more copper ore in the United States has been mined with Texaco lubricated equipment than with any other.

LONG LIFE... FOR A LONG LIFT

It's a heavy load, a fast lift—but wire rope stays strong, longer, because it's fully protected by Texaco Crater

That's because Texaco Crater penetrates to seal the core. At the same time, it surrounds the strands and separates them with a tight protective film. This sturdy film protects the rope against internal and external friction—and wear. And because the film adheres so tightly to metal, it prevents corrosion and rusting.

This same lubricant does double-duty on open gears, too. It clings to the teeth, won't ball up or throw off, cushions against shock and heavy loads, and acts to prevent wear.

Operators who prefer the spray method of application use Texaco Crater X Fluid—for both wire rope and open gears. This outstanding, convenient product *goes* on as a liquid (no heating required), and *stays* on just like the regular Crater. Gives the same fine long-lasting protection.

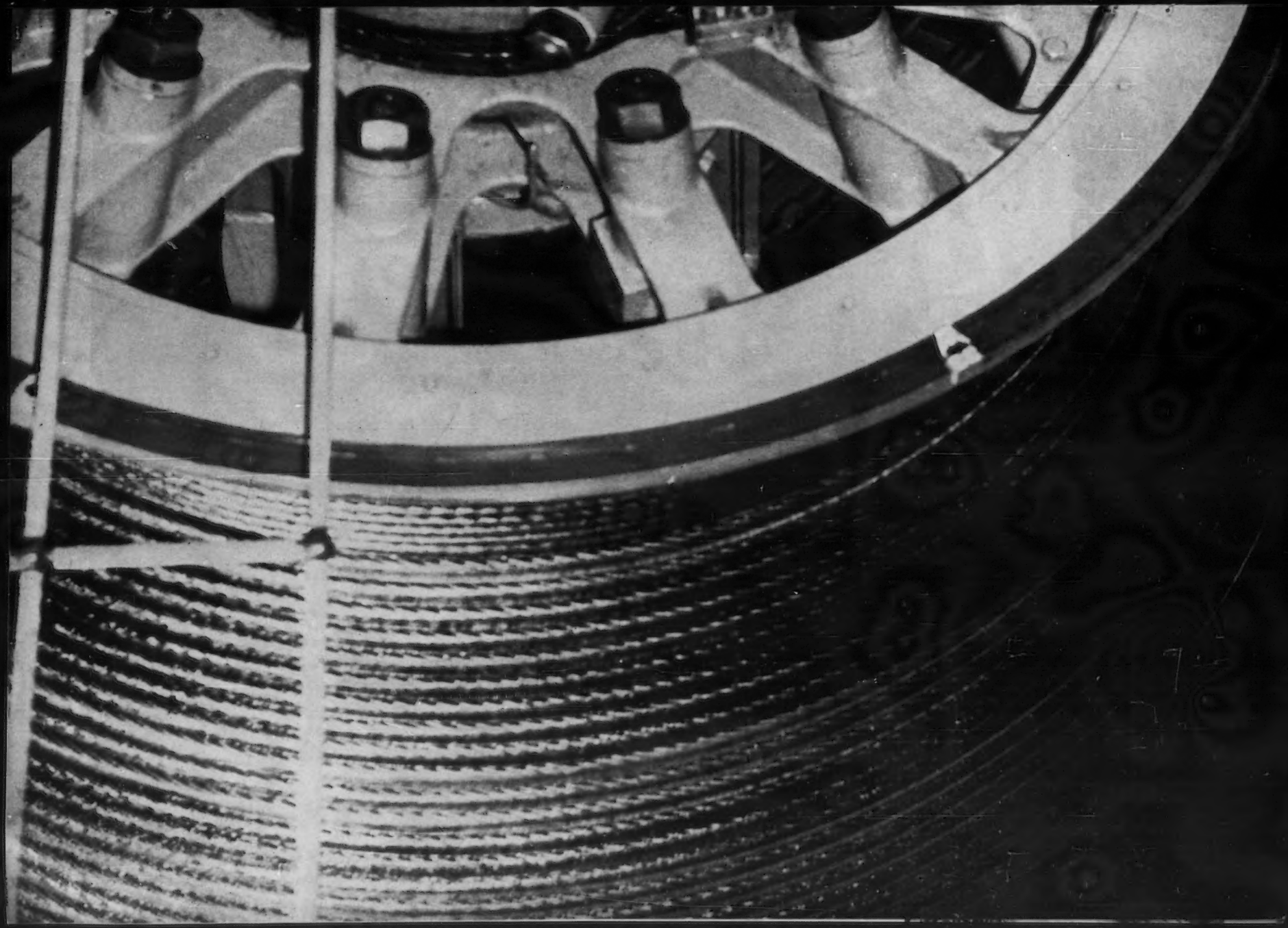
Texaco Crater and its spray-on counterpart, Texaco Crater X Fluid, are only two of Texaco's complete line of famous products for mining equipment. Let a Texaco Representative help you draw up a Simplified Lubrication Plan for all your mining equipment. Call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

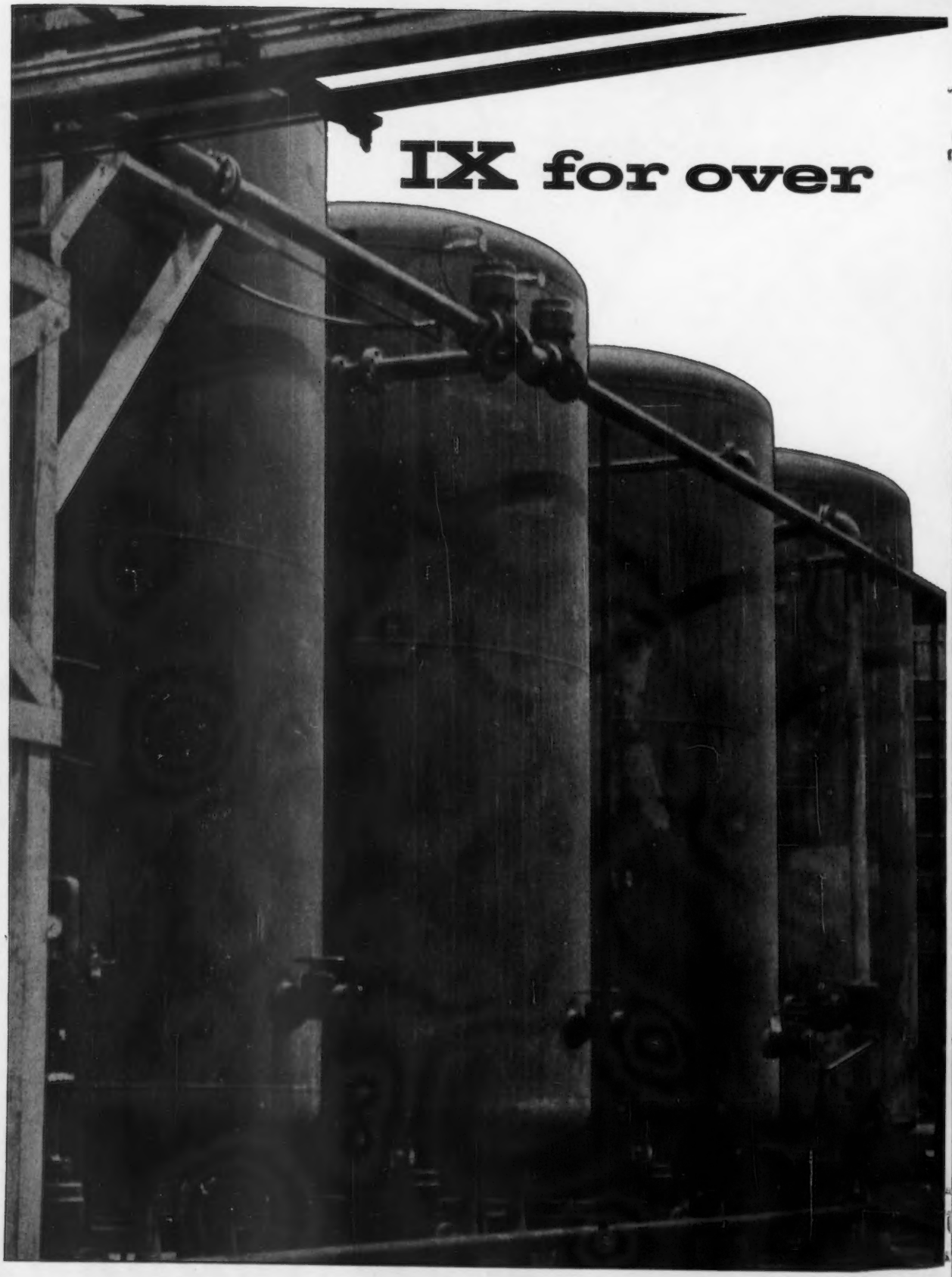
☆ ☆ ☆

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

(PARTS, INVENTORY, PRODUCTION, DOWNTIME, MAINTENANCE)




IX for over

94% URANIUM RECOVERY

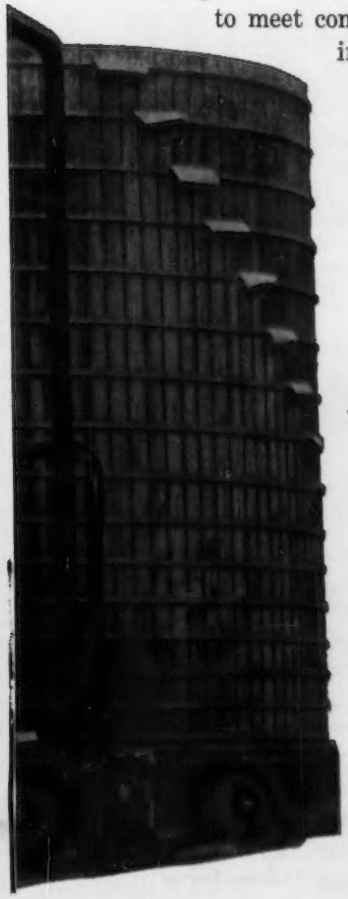
New Dawn Mining Co. mill achieves high extraction with
DORRCO ION-EXCHANGE SYSTEM

One of the most successful ventures in the field of uranium extraction is the new 440-ton mill of the Dawn Mining Co., near Ford, Washington. Using the ion-exchange process, the plant has achieved better than 94% overall recovery. The ion-exchange system, along with other process equipment, was supplied by Dorr-Oliver.

The design of efficient ion-exchange systems to meet complex and widely varying requirements of the mining and other industries is but one of the services offered by Dorr-Oliver. Every ion-exchange system is individually designed and developed for maximum utilization of cell volume, most efficient use of resins and uniformly high performance despite the many fluctuating factors in operating cycles.

Complete Dorr-Oliver service which may be brought to bear on any plant engineering problem includes laboratory testing, pilot plant proving to determine operating factors and equipment sizes, economic analysis, plant design specifications, responsibility for plant construction and supervision of initial operation, together with personnel training.

For complete information on the full scope of Dorr-Oliver equipment and services, contact Dorr-Oliver Incorporated, Stamford, Connecticut. Ask for Bulletin No. 7003.



Four 8 x 15-ft. columns of the Dorrco ion-exchange system installed at the Dawn Mining Co. mill are shown at left. Each column is equipped with a bottom distribution piping system, overlaid by sized gravel and sand. The anion resin rests on the sand and occupies a 270 cubic-ft. space up to the upper distribution piping. Three columns are on stream during the loading cycle. Solution is received under pressure at the top of the lead column, forced through the resin bed and then passed through the bottom distribution pipes to the top of the next column. Successive stripping results in barren effluent from the third column. Latest figure on actual U_3O_8 recovery in this column IX process is 99.18%.

DORRCO—T. M. Reg. U.S. Pat. Off.

DORR-OLIVER
INCORPORATED
WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT
STAMFORD • CONNECTICUT • U. S. A.

"Talk up" increased production—greater safety...with these M-S-A COMMUNICATION SYSTEMS

M-S-A MINEPHONE

Dispatcher sends orders instantly and simultaneously to all motormen with this modern, underground two-way voice communication system. Motormen receive and reply while trips are in motion—keep haulage movements coordinated with production demands. This results in smoother, faster, and more continuous trip movements throughout the mine.

Messages clear tracks for outgoing loaded trips and incoming empties. This system puts an end to traffic tie-ups, errors and accidents; prevents excessive stop-and-start strain on equipment. Write for more detailed information.

• Dispatcher sends orders to motormen . . . routes right-of-way traffic . . . receives reports on positions and station conditions.

• "Jeep" operator requests instructions from dispatcher and maintenance shop for section assignment . . . speeds emergency repair.

M-S-A HOISTPHONE

For accurate, instant response between the hoisting engineer and cage, here's the voice communication system to install. Whatever the job—load leveling—shaft repairs—shaft inspection trips—passenger transportation—the M-S-A HoistPhone provides better safety and efficiency through dependable, continuous two-way voice communication at any level, and while the cage is in motion.

Requires no special training . . . simple to use . . . dependable in operation. Write for further information.

• The hoisting engineer is able to control all movements of the cage by communicating with cage rider over the M-S-A HoistPhone.

• Worker uses microphone in cage to tell the hoisting engineer where he wants to go. Loudspeaker mounted on top of cage.

MSA
SAFETY EQUIPMENT HEADQUARTERS

When you have a safety problem, M-S-A is at your service . . . our job is to help you

MINE SAFETY APPLIANCES COMPANY
201 North Braddock Avenue, Pittsburgh 8, Pa.
At Your Service: 77 Branch Offices in the United States and Mexico

MINE SAFETY APPLIANCES CO. OF CANADA, LTD.
Toronto, Montreal, Calgary, Edmonton, Winnipeg, Vancouver, Sydney, N.S.

GOODYEAR TIRES

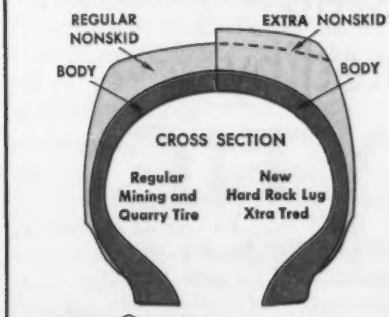
Look for this nearby Goodyear dealer sign for better tire values — better tire care.

GOODYEAR'S *NEW*

HARD ROCK LUG XTRA TRED

(Tubeless or tube-type, 14.00, 16.00 and 18.00 cross-section sizes)

BUILT SPECIFICALLY FOR MINING AND QUARRYING OPERATIONS!



Like steel, tire cord must be tempered to be tough. Goodyear's exclusive 3-T process, involving Tension, Temperature and Time, triple-tempers cord to make it TRIPLE-TOUGH – to give you longest tire life, lowest cost-per-yard!

The new Hard Rock Lug XTRA TRED is a *specialist.* It has everything the famous Hard Rock Lug family ever had – plus what it takes to keep you rolling on your roughest jobs.

More tread rubber–delivers up to 50% longer tread life. Special, tough-formula rubber holds tread cuts to new LOWS. Bigger, reinforced lugs–burlier shoulders–huskier sidewalls–add new capability, new reliability.

And it's built with Triple-Tough 3-T Nylon Cord – the greatest tire *saver* in 23 years!

The new Hard Rock Lug XTRA TRED wants the toughest tread-wearing jobs you can offer. Visit your Goodyear dealer–and start it rolling up savings!

Goodyear, Truck Tire Dept., Akron 16, Ohio.

Xtra Tred–T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

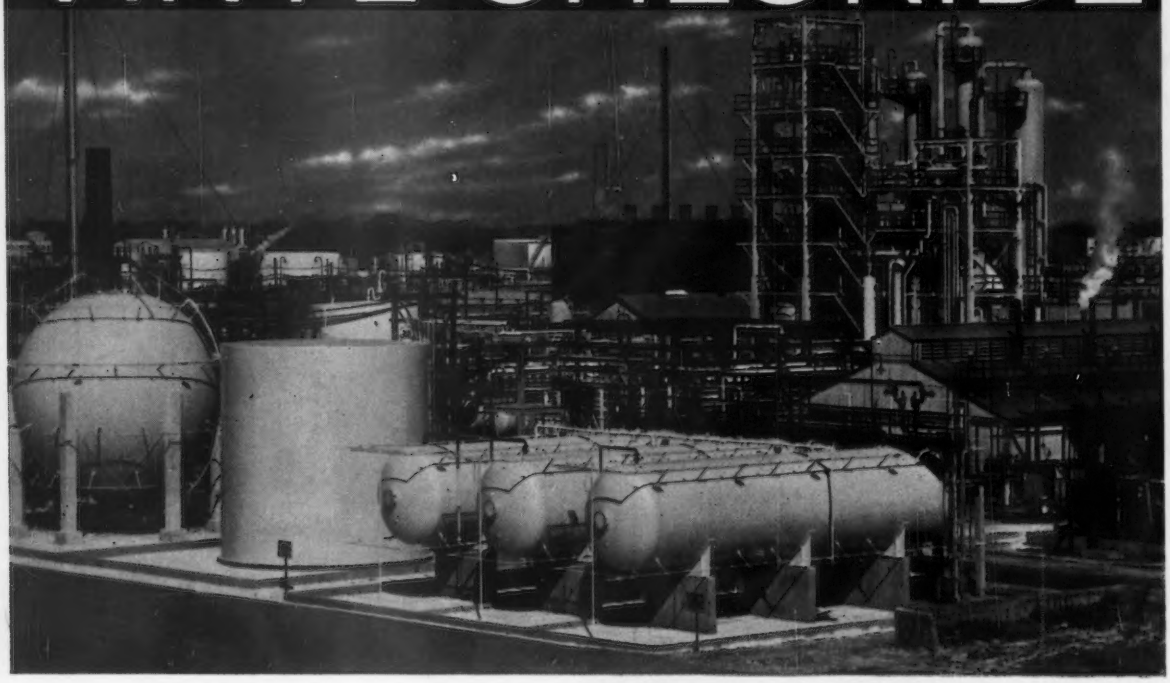
GOODYEAR

60 YEARS

MORE TONS ARE HAULED ON GOODYEAR TRUCK TIRES THAN ON ANY OTHER KIND

Ethyl Corporation

VINYL CHLORIDE



plant engineered
and constructed by

CATALYTIC

Ethyl Corporation selected CATALYTIC for the engineering, procurement, and construction of its new Vinyl Chloride Plant. Close cooperation and coordination between Ethyl and CATALYTIC, utilizing to the fullest their joint experience with chlorinated hydrocarbons, resulted in successful on-stream operation of this plant within the scheduled completion time and budget.

CATALYTIC Construction Company

Philadelphia 2, Pennsylvania
Baton Rouge, Louisiana
Toledo, Ohio
Tulsa, Oklahoma

In Canada: Catalytic Construction of Canada, Limited; Sarnia, Ontario; Toronto, Ontario; Montreal, Quebec

Catalytic *On-Time*... *On-Budget* Services
for the metallurgical, chemical, petrochemical and oil refining industries: Project Analysis; Process Development; Process Design; Economic Studies; Engineering; Procurement; Construction.

TAKING OUT 2% OF THE FREE WORLD'S ASBESTOS!

Model 80-D side casts overburden

Model 25 loading Asbestos Ore

Here are the pits of Cassiar Asbestos Corporation, Ltd. at Cassiar, B.C. Northwest shovels are taking out some of the finest spinning fibre asbestos of North America. Cassiar Mines are 86 miles southwest of mile 649 on the Alaska Highway and are almost 6500 ft. above sea level. Temperatures range from plus 75° to minus 30°.

Here are four Northwests on the job. Ore is loaded to 16 yd. trucks by a Model 6, 1½ yd. Shovel. Waste is handled by an 80-D, 2½ yd. Shovel to 16 yd. trucks. These machines work 24 hours a day from July to September inclusive. Both machines put in over 4000 hours during this time. Two other Northwests are in the Company service.

Out of the way locations like this can be served profitably only by dependable equipment. *Your Northwest is always ready to go. We hear it everywhere* and Northwest users will tell you so.

Rugged operations like this call for equipment that is easily moved, power plants that are properly engineered for high altitude, controls that are dependable regardless of temperature and other advantages for handling hard digging that have made Northwests recognized as outstanding in rock digging.

If your conditions approach these at Cassiar, you would do well to find out all about Northwest equipment. Northwests have proved themselves in some of the continents' hardest mining operations. Ask for more details.

NORTHWEST ENGINEERING COMPANY

1509 Field Building • 135 South LaSalle Street • Chicago 3, Illinois

NORTHWEST

Always Ready to GO

Convertible for any Mining Material Handling or Excavation Problem

NORTHWEST EQUIPMENT IS BUILT IN THE FOLLOWING SIZES

SHOVELS	CRANES	DRAGLINES	PULLSHOVELS	TRUCK CRANES
⅜ Yd. to 2½ Yd. Capacity	13-Ton to 50-Ton Capacity	⅝ Yd. to 3 Yd. Capacity	⅜ Yd. to 2½ Yd. Capacity	25-Ton and 35-Ton Capacity

NEW CHEMICALS *play important mining role*

Recent economic shifts throw even more burden on mining processors. And more and more mining men are looking to chemicals to ease that burden. For several years modern mining chemicals from Dow have helped to improve ore processing and increase yield. How mining men use Dow chemicals and technical service to deflate operating costs and make recovery more efficient is highlighted below in condensed form for busy executive reading.

You may wish to check certain items in this advertisement and forward to those concerned in your company.

ROUTE TO:

_____

_____

_____

_____

MINING MEN MAKE SEPARAN FLOCCULANTS PAY OFF

Although it might be said that Separan NP10* was born with a mineral spoon in its mouth, it took a lot of cooperation on the part of mill operators to develop this new flocculating agent. In the past four years, Separan has gained widespread use in the industry. Prospects for the future include an entire family of Separan products for specialized recovery assignments.

*SEPARAN NP10 IS AN IMPROVED FORM OF SEPARAN 2610

In 1954, a new type of synthetic flocculant was christened Separan® in Dow laboratories and prepared for its debut to industry. Every characteristic of the new material pointed it toward a brilliant career in mining. Its settling rate with many different types of ore was unbelievably fast. Floc formations were almost ideal. Resultant filter cakes were thick and porous.

Will it work? The big question was, "Can Separan be made to function as well in the field as it does in laboratory tests?" The only way that question could be answered was by use under actual operating conditions in recovery equipment. Dow technical service men visited mills throughout the mining world.

At first, there were many problems to be solved. How much Separan was most efficient for a specific ore and a specific operation? What percentage solution should be used? How much time should elapse from one addition of Separan to the next? Where, when and how should Separan be introduced into the leached ore?

Pieces fit puzzle. The answers came slowly at first, but mining men were interested in the unique abilities of this new flocculant. Their diligent cooperation with Dow specialists soon paid off. In early 1955 the pieces of the puzzle began to fit together and Dow was able to intelligently advise other mill operators about the use of Separan.

Ore	Before Tons/ Day	After Tons/ Day	
Very slimy	50	400	at 1.0# Separan NP10/T
Blended	200	450	at 0.6# Separan NP10/T
Blended	250	500	at 0.5# Separan NP10/T
Good limestone	350	500	at 0.15# Separan NP10/T

Increased filtering rate resulting from use of Separan NP10.

Separan increases recovery capacity without adding equipment.

One of the most spectacular areas for Separan proved to be in the recovery of uranium. Today, this useful flocculant is in widespread use in the uranium mining industry. Dow technical servicemen (who average sixteen years of mining experience per man) are still working side by side with processors.

New family of flocculants. Meanwhile, in Dow laboratories, other specialists were developing Separan NP20, the newest addition to the Separan family of flocculants. Like Separan NP10, Separan NP20 is a new high-molecular weight polyacrylamid material. It has the highest flocculating activity of any commercially available flocculant. This is a part of a continuing Dow program to provide new and useful chemical "tools" for the entire mining industry.

DOWFROTH:
lively, long-lived frother

One of the best frothers yet devised for use in the flotation process is Dowfroth® 250. With as little as 25% of the quantity it takes with other frothers, it sustains a lively controllable frothing action. Dowfroth won't harm rubber parts in flotation machines and its froth can be readily laundered, pumped and thickened.

Easy to see why profit-minded mining management men are enthusiastic about Dowfroth. Says one, "A Dow field man urged us to try Dowfroth 250 for a particularly tough frothing problem. It did an excellent job and now we use it in all our flotation units."

★ ★ ★ ★

For information on any of the chemicals discussed in this advertisement write THE DOW CHEMICAL COMPANY, Chemicals Sales Department 764J, Midland, Michigan.

XANTHATES:
nine little Indian boys

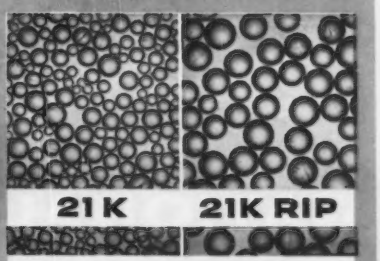
Metallurgical engineers can choose from nine highly selective Xanthates.

Like the early American Indian, Dow Xanthates are so inconspicuous in their natural environment — in this case, flotation processing — that you have to look hard to find them. These nine highly selective collectors come in water-soluble pellet form, easy to handle and apply. No dust, no waste. They're essentially nonfrothing. This makes for better control all the way around. Even though you can't see them, a glance at the metallurgical results tells you Xanthates are there all right, silently, unobtrusively and efficiently doing their job.

Flotation Fundamentals is the name of a Dow handbook that's been on the mining "best seller" list for several years. Brand-new revised edition now available makes helpful reading for anyone concerned with mineral recovery. Contains hundreds of facts and figures, tables and metallurgical data.

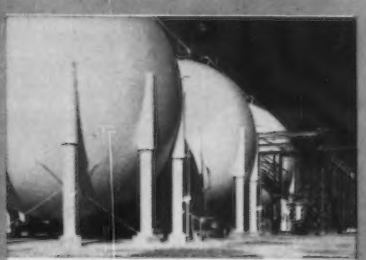
On the mining chemical NEWSFRONT

SOLVENT EXTRACTANTS. Dowsol* 12, brand-new organic phosphate extractant for solutions, pulps and slurries of uranium. A monododecylphosphoric acid (DDPA) as a 25-30% solution in kerosene . . . transfers metal values from solution to solvent. *TRADEMARK



ION EXCHANGE RESINS. Two new entries in the field, Dowex® 21K and Dowex 21K RIP, lend new effectiveness and economy to such tasks as removing and concentrating uranium from acid solution. Complete line of resins and expert technical service immediately available.

Z®-200. Something new in flotation reagents . . . a tailor-made unique, collecting agent for copper minerals and copper-activated zinc minerals where rejection of pyrite is of critical importance. Superior to any other collector in this application.



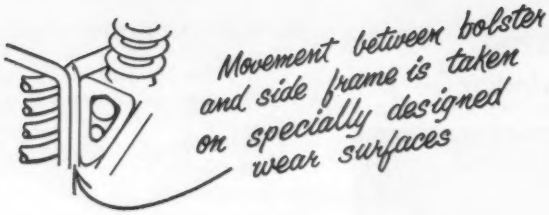
AMMONIA. New trend: Dow Ammonia used three new ways. Extracts nickel from low grade non-sulfide ores. Precipitates uranium from pregnant solution. Pressure leaches copper-nickel flotation concentrates to recover the two metals separately in powder form.

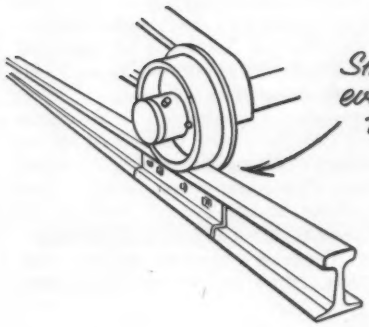
DOW CHEMICALS BASIC TO THE MINING INDUSTRY

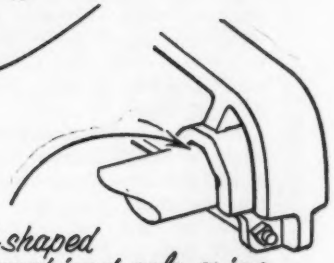
Flocculants • Ion Exchange Resins
Preservatives • Chelating Agents
Ammonia • Solvent Extractants • HCL
Frothers • Chlorine • Calcium Chloride
Alkalies • Flotation Agents

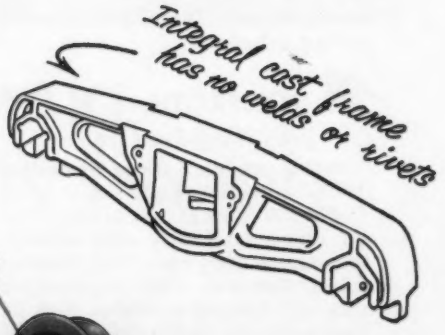
YOU CAN DEPEND ON

DOW









Check these "plus" features OF NATIONAL NC-1 TRUCKS

If you're considering the purchase of new 8-wheel mine cars . . . or if you're thinking of modernizing older cars—*now* is the time to check the advantages of National NC-1 Trucks. National NC-1 Trucks have controlled flexibility for track variations yet still maintain truck alignment through their machined V-shaped axle grips. In addition, NC-1 Trucks have a built-in shock absorbing mechanism.

You get more out of your mine car investment per workshift . . . per day . . . per year. And at the same time you minimize spillage . . . get greater protection for your equipment, track and structures . . . slash maintenance to a new low.

Yes, *now* is the time to check National NC-1 Trucks—they make sense for 8-wheel mine cars . . . *make dollars for operators,* too.

■ WILLISON AUTOMATIC COUPLERS
RUBBER CUSHIONED UNITS
NC-1 CAR TRUCKS • NACO STEEL WHEELS
NACO STEEL LINKS & SWIVEL HITCHINGS

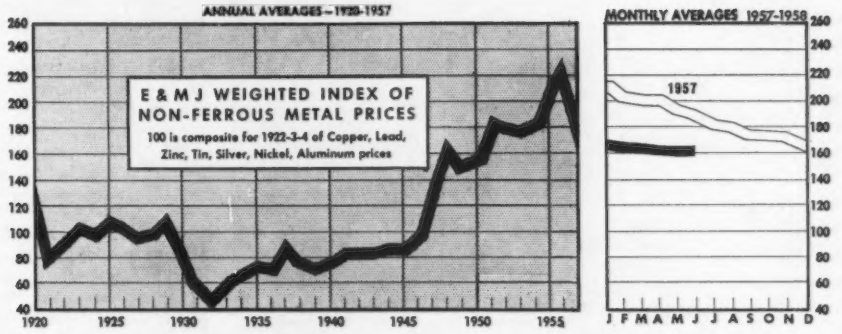
AA-5077

NATIONAL MALLEABLE and STEEL CASTINGS COMPANY

Established 1868 — *Cleveland 6, Ohio*

E&MJ OUTLOOK

PRICES



MARKETS

Except for an insignificant flicker in April 1957, non-ferrous metals prices inched up for the first time since March 1956. E&MJ's price index for June is 164.73 as compared with 164.65 for May.

Domestic aluminum producers are asking the Senate Interior Committee to set up a 150,000-ton purchase program at a price not to exceed 27c per lb to place aluminum on an equal footing with the competitive metal, copper.

●

AT HOME

U.S. Chamber of Commerce has gone on record as being opposed to Federal price supports for domestic minerals. Instead, it recommends use of the escape clause in the Reciprocal Trade Agreements Act to stem the flow of imports by increased tariffs, quotas or both.

Studies show that only 40% of auto battery failures in severe service are due to electrochemical reasons. The rest are caused mechanically, mostly from vibration. Electric Auto-Lite Co. has developed a rigid shake-proof unit which carries a 50-month guarantee.

Rare earths stand "on the brink of a useful future," reports Battelle Memorial Institute. New-found feasibility of large-scale production is responsible for current enthusiasm over rare earths.

Freeport Sulphur Co.'s new booklet "Nickel and Our Frontiers" predicts a sharp upswing in the use of nickel because of growing applications in missiles, turbine engines, stainless steel cladding, nuclear power and electronics.

The Society of Automotive Engineers reports that it is probable that iron-aluminum base alloys can be used to produce stainless steel at prices competitive with those of straight-chromium, nickel-free stainless steel.

●

LABOR

Severe anti-racketeering legislation is not likely in this session of Congress. Politicians shun a clamp-down on labor in election years. But this doesn't mean that the McClellan rackets investigating committee will pull any punches in the future. See p 21.

International Union Mine, Mill & Smelter Workers persuaded Montana Public Service Commission to deny telephone rate increases sought by Mountain States Telephone & Telegraph Co. IUMMSW is also spearheading a fight against higher food prices.

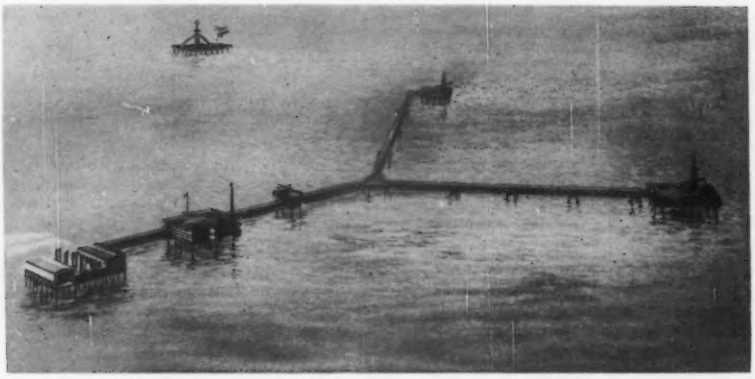
●

ABROAD

Brazil is awakening from its extreme conservationist position and realizing that ore in exchange for capital goods is beneficial to the economy. GeoSurveys reports that iron ore exports, which totaled 3-million tons in 1957, will be boosted to 8-million tons by 1959, and eventually to 20- to 30-million tons. Kaiser Construction Co. and Hanna Coal & Ore Co. may do initial work.

Canada is recovering from the recent economic slump much faster than the U.S. Higher consumer spending and employments are buoying up the economy.

THIS MONTH IN MINING



A Y-SHAPED ISLAND will be the man-made working platform for Freeport Sulphur Co.'s new $30-million Grand Isle mine, and home for 260 men in operating crews.

Freeport Starts Work on Grand Isle

THE WORLD'S FIRST offshore sulphur mining plant is being erected seven miles off the coast of Louisiana by Freeport Sulphur Co. Grand Isle, the $30-million Freeport project, is due to produce Frasch sulphur sometime in 1960.

Grand Isle will consist of a Y-shaped steel island rising 55 ft above water level and nearly a mile long. A second, smaller island will support a separate drilling platform.

The largest of the island's installations will be a heating plant which will use a patented process, developed by Freeport, that permits use of sea water in the Frasch system. The plant will use 13-million cubic ft of gas to heat 5-million gallons of sea water per day to 325 deg F for injection into the underground formation. Freeport's process is said to permit the heating of sea water with a minimum of corrosion and scaling.

Basic structure of the steel island will rest on five large, and 10 smaller steel-pile towers. Special templates will be used to guide pile-driving and also to add strength for resistance to hurricanes.

AEC Discusses Gas Hills Expansion Setup

THE ATOMIC ENERGY COMMISSION has laid down in some detail the ground rules by which it expects to conclude contracts leading to uranium mill expansion in Wyoming's Gas Hills District.

In letters sent to some 42 companies and individuals with ore reserves in the area, the AEC also stipulated a "deadline" of June 30 by which it expected some six firms, or groups of firms, to come up with alternatives to proposals for mills presented to the AEC's Grand Junction Operations Office on or prior to Nov. 1, 1957.

All negotiations are being or will be conducted with an eye to the reserves established by a Commission team on Nov. 1, 1957 at the district.

AEC has authorized, on basis of reserves, an addition of some 1,700 tpd of uranium capacity, which is believed by the agency to be large enough to carry through Dec. 31, 1966 the concentration of all ore reserves established on Nov. 1, 1957.

With authorized or completed concentrator capacity already on the books, the addition will bring to 3,500 tons the total for the Gas Hills-Crooks Gap area some 50 miles from Riverton, Wyo.

AEC has announced that it is, however, taking an over-all look at existing or authorized capacity in light of the concentrates buying program which will start on April 1, 1962 and go on until the Dec. 31, 1966 end date.

The revision of mill proposals noted in its letter is necessary because: 1. Such proposals contemplated sales under the present Circular Five plan, ending March 31, 1962 and of course contained much larger mill capacity (a total of 5,000 tons or more). 2. Eventual extension of existing contracts, ending March 31, 1962 for concentrates purchasing, to Dec. 31, 1966, would "stretch out" the concentrate buying as well as daily ore runs.

The agency has also told various principals to discussions that it considers the $8 price per pound of U_3O_8 as the basis for new contracts to be concluded now for the concentrates. This is the base price, incidentally, the AEC has established for the 1962-66 program.

It is also apparent that for any existing mills with a price above $8 per lb on the 1962 program, a renegotiation of contracts leading to extension through 1966 will probably involve a price reduction. This has been the pattern in other areas of the domestic picture.

Concentrate prices for individual mills remain largely a confidential matter at this time, although there is a good deal of general conversation about them both by Governmental officials and industry principals, who for most part have been arguing for some years for removal of the official veil of secrecy.

Not only price, but also the official views of AEC representatives on economic or efficient size of mills which are likely to be approved has caused some concern among "bidders" for concentrates sales contracts with the agency, insofar as Gas Hills district is concerned.

AEC has indicated that at $8 a lb, with ore running average grade (0.25 U_3O_8) a mill to be efficient should have a daily input of about 750 tons.

So far as *EM&J* can establish, no one group of contenders for mill expansion in the district can at present qualify on the above basis for a mill, or expansion.

It is apparent that Lucky Mc Uranium Corp. with Phelps Dodge Corp. have probably the largest allotment, nearly 500 tons based on the two firms' captive ore, observers estimate. This is in addition to the Lucky Mc's present authorized daily tonnage.

AEC in its letters to operators did not combine the figures for groups associated at present in mill proposals, of course.

One cannot assume anything in these negotiations at this time, however. For example, Lucky Mc was relieved of its obligation to run the stockpile of ore piled up by the old buying station at Riverton. Also, this firm's contract at present runs to March 31, 1962. And AEC is *definitely* looking at the 1962-1966 plan in dealing for new, and added facilities, and renegotiation of existing capacities.

Federal Uranium Corp. is given by insiders sufficient ore reserves to construct a 400 tpd mill—a capacity somewhat below what the agency is suggesting for efficiency. Another major contender for mill proposals which is given a good ore reserve in the range of Federal's is the proposal of Vitro Uranium Co. (Vitro Corporation of America) with Lisbon Uranium Corp. (Atlas Corp.)

Other proposals in the district for mills include that of Globe Mining and Milling Co., Casper, Wyo. (an independent mill). In this connection, Union Carbide Nuclear Corp., a division of Union Carbide Corp., had an agreement with Globe (which expired in March) by which UCN would have joined in the mill.

Fremont Minerals, with foundations for a 400 tpd-plus mill at Riverton itself, would have to be included in consideration of any program running until 1966.

This firm's capacity is authorized solely as a custom unit. All other authorized or existing mills have custom allotments.

Western Nuclear Corp., Rawlings, Wyo., operating mill at Crooks Gap, also is seeking an expansion.

The opinions of the AEC on what constitutes an efficient-sized mill at the district are not taken lightly, of course. Neither is the deadline, which, as it approaches, has put great pressure on companies to make deals among them-

selves and others at the 750 tpd level. Such arrangements could be supported only by sufficient ore reserves as established by the AEC.

There also is a very solid implication in the AEC letter that those firms who rushed in with mill proposals last fall—or much earlier—will have no "priority" if they fail to come up with satisfactory arrangements with other producers leading to revised proposals submitted to the AEC before the June 30, 1958 deadline.

In all this, the AEC has sought to avoid "directing" any agreements. It has laid a general path down which competitors for mills may race until the game is ended.

A company or group of companies who tossed in an early mill proposal and who fail to revise and meet the new conditions would, of course, still be afforded a market for ore, as provided in the added 1,700 tpd of capacity.

Two factors are tending to complicate pencil work by those figuring out their approaches to the ground rules announced by the commission.

First, AEC has indicated that it is not taking into consideration haulage allowance past March 31, 1962. This is a most significant revelation for the industry as a whole—which has been seeking some commitment from the agency in this regard.

Orebodies located some distance from mills, existing or planned, must have their profit status reviewed. If haulage allowance is to be discarded.

Second, even though the AEC has announced the expansion at Gas Hill in terms of 1,700 tpd of ore through concentrators, the negotiations for milling expansion will be conducted with reference to pounds of uranium concentrates purchased.

While ore reserves have been computed on a value or grade basis by the agency, operators must be ever mindful of what has happened at other mills

(*Continued on p 126*)

Mining Calendar

13th Purdue Industrial Waste Conference & Exhibit. Convention Hall, Philadelphia, Pa., Sept. 19-19

Rocky Mountain Minerals Conference, AIME, Salt Lake City, Sept. 17-19

American Mining Congress, San Francisco, Calif., Sept. 22-25

Metallurgy '58—Norweigan Industries Development Assn., Oslo, Oct. 15-26

7th National Clay Conference, U.S. National Museum, Washington, D.C., Oct. 20-23

Mid-America Minerals Conference, Society of Mining Engineers, AIME, Chase-Park Plaza Hotels, St. Louis, Oct. 23-25

Metallurgical Society of AIME, Fall Meeting, Detroit, Mich., Oct. 27-30

4th Annual Symposium on Mining Research, Missouri School of Mines, Nov. 13-14

As We Went to Press . . .

Congressional approval of the Alaskan statehood bill has already focused attention on the investment possibilities in the Territory which, when it enters the Union, will replace Texas as the largest state. The President must sign and Alaskan residents must vote their approval before we can scrap all our 48-star flags.

Though chances for success appear slim, some of the gold miners who lost their appeal for damages under L208 in the Supreme Court will "probably appeal." (See p 126.)

Dr. Donald McLaughlin, president of Homestake, said a request for a re-hearing would be based on the arguments in the dissenting opinions of two of the justices, but "our chances are slim."

H. L. McIntyre, president of Pacific Industries (successor to Central Eureka) felt his company could do little but abide by the decision. J. N. Dicks, secretary of Idaho Maryland, saw little hope in a re-hearing appeal.

Mineral exploration and mapping of Flathead, Lake and Lincoln counties in Western Montana, under a five-year program, will be financed by Great Northern Railway and Pacific Power & Light, in cooperation with the Montana Bureau of Mines and Geology.

"The joint program," the sponsors said, "is designed to meet the needs of the professional geologists and independent prospectors by providing adequate geological mapping." A free minerals identification service will be offered at the bureau's office, to be set up at Kalispell.

Milliken Lake, the sixth Rio Tinto group property in the Algomo region of Ontario, is planning on full capacity production by this month. The mine and mill passed the half-way mark several weeks ago and is now preparing for the scheduled output of 3,000 tpd.

A search for beryl oil led to the discovery of what may be "the finest and most beautifully colored emeralds the world has ever seen." The find was made by two South Africans in Southern Rhodesia, south of Belingwe, in the Mweza Hills. The description of the stones came from the Rhodesian Minister of Mines, according to a story in *The New York Times.*

The two owners, Lawrence Contat and Cornelius Oosthuizen, reportedly turned down an offer of £1-million for a one-fourth share of their property.

Canadian production of thorium salts will begin in January 1959 when the newly formed Rio Tinto Dow Ltd. completes construction of a million-dollar plant at Blind River.

Initial production of the plant, which will be at the Algom Quirke property in the Blind River uranium camp, will be around 100 to 200 tons per year. Production will be in crude thorium concentrates, refined metallurgical grade thorium sulphate and thorium oxide.

The move is one of the first major developments arising from the formation of the new company—by Rio Tinto Mining Co. of Canada and Dow Chemical of Canada, Ltd. The new firm was created to do research work on possible production of thorium and rare earths from by-product materials of uranium mining. Dow will handle the marketing of the plant's products.

WASHINGTON IMPACT

Highlights

SCORE A BREAKTHROUGH for domestic metal-mineral producers' drive to win new Federal support under shaky markets. For the first time in nearly three years of political tug-of-war between the mining industries and the Administration over the issue of Government aid policy, mining-state Senators have reached a sort of rapprochement with Interior Secretary Fred A. Seaton on how to extend Washington's helping hand to hard-pressed victims of the current commodity recession.

It's a qualified victory. First, because not all producers will get anything like the market guarantees they have been seeking—a revival of wide scale, war-born stockpile purchasing and a return to restrictive import protection. Second, because the new good will exists only between Seaton and the Senate Interior Minerals Subcommittee headed by Sen. James Murray (D-Mont.). Whatever "stabilization plan" may pass the Senate, where producers' political strength is proportionately greater than in the House, it will run into tougher opposition in the budget-minded Lower Chamber.

But the fact remains that mining leaders in the Senate now feel Seaton is on their side. He not only has rejuggled his stabilization proposals several times since he first presented a long-range mining policy plan last year—in itself a precedent-setting approach—but even more important he has been working closely with Murray's committee, and will probably deliver White House backing for further changes the Committee is seeking (see story, this page).

Several recent developments at home and abroad have combined to create an atmosphere which practically forced Seaton and Murray into closer cooperation and compromise. One is the fact that the Administration is convinced it needs to do something for domestic producers to lessen their opposition to its Reciprocal Trade Agreements Act extension bill. Another is that Washington feels it must help metal-mineral producers in underdeveloped areas slough off the present economic commodity pinch that has contributed to international tensions, and that makes it even more important politically, in this Congressional election year, to "begin charity at home".

The basic issue of a long-range mining policy won't be solved this year, regardless of what Congress may enact in the way of stopgap help.

TIMING ON THE TRADE BILL in the Senate this month is important to mining-state Senators. If the Senate Interior Committee gets its minerals stabilization bill to the floor before Finance Committee clears the Reciprocal Trade Agreements Act extension bill for debate, domestic producers will be in a better tactical position to bargain. Once through the Senate, an acceptable minerals support measure would take some steam out of Senate protectionists' efforts to write higher tariffs or quotas into the trade bill. Even the promise of new Government mining aid will have the same effect, many Capitol Hill tacticians believe, if the Trade Act comes up first.

In any event, trade restrictionists will try to make three main changes in the House-passed bill. One would cut its duration from five to three years. Another would increase Congressional veto powers over the President on tariff negotiations. The third major change due for a floor fight will be the question of tariffs and quotas. An effort in that area will be made regardless of what happens to the minerals bill.

FREER BARTER RULES governing the swapping of domestic crop surpluses for foreign metals and minerals won House backing in its omnibus farm bill—but the House refused to vote on the catch-all bill in its present form. This means the Agriculture Committee will have to report the barter amendments back to the House in separate legislation. The Senate previously turned down amendments aimed at forcing Agriculture Department's Commodity Credit Corp. to ease its strict regulations which have brought barter to a virtual standstill. The new regulations, which still must get both House and Senate approval, would require the CCC to show that barter deals are replacing normal commercial crop sales overseas before disapproving them, instead of requiring importers to show that they are not.

Passage for Subsidy Plan Is Seen Likely

THE SENATE this month will vote on a precedent-setting package of proposals designed to help domestic mining industries pull out of the current commodity recession.

Chances are good that it will pass, in essentially the form unanimously approved by the Senate Interior Committee. Interior Secretary Fred A. Seaton has been cooperating closely with chairman James Murray (D-Mont.) in working out a compromise acceptable to mining-state Senators and the White House, and has promised to deliver Administration backing for the changes made in his previous proposals.

Here is what the new legislation would do:

- Authorize a one-year Government stockpile purchase program for domestic copper, totaling 150,000 tons of electrolytic grade metal at 27½c per lb.
- Set up a five-year price support subsidy payment plan for lead and zinc, aimed at stabilizing U.S. prices at 15½c for lead 13½c for zinc.
- Provide a similar plan for acid-grade fluorspar and tungsten, at $53 per ton and $36 per short ton unit, respectively.
- Grant in separate legislation new production bonuses for beryl, chromite and columbium-tantalum.

The subsidy plan would also include incentives to small producers, by providing additional payments of 17c per lb for lead and 14½c for zinc, on the first 500 tons of each metal produced each quarter, and an extra $18 per ton for fluorspar producers whose annual output does not exceed 2,500 tons.

Annual limits placed on the subsidies would be 350,000 tons for lead, 550,000 tons for zinc, 180,000 ton for fluorspar, and 375,000 units for tungsten. Payments also would conform to quarterly limits on each producer.

The separate legislation dealing with production bonuses would grant $70 per ton for 750,000 tons of beryl, $35 per long dry ton for 50,000 tons of chromite, and $2.35 per lb for 50,000 lb of columbium-tantalum.

The proposals include increases over Seaton's original plan, but do not provide for stockpiling lead-zinc, or subsidizing antimony, cobalt and mercury. Amendments offered in committee to expand the program to include these moves were defeated by close to a 2-1 vote margin. Antimony, cobalt and mercury may be included in the separate production bonus bill.

The five-year plan would be financed by a loan from Treasury Department to Interior, rather than by direct appropriations from Congress, and would be subject to yearly Administration review and progress reports to Congress.

It also sets ceilings on subsidy pay-

ment—4c per lb on lead-zinc, $5 per ton on fluorspar, and $18 per unit on tungsten.

Willful violations on the part of producers benefiting from the program would be punishable by as much as $10,000 fine and 10 years' jail sentence.

Final agreement on the package program came after Seaton's top advisers convinced the Committee that further expansion would hurt the State Department in its current efforts to talk international production controls with competing nations.

Holdup on Tariffs

THE TARIFF BATTLE continues, even though it has been slowed by Senate consideration of the Seaton plan.

On specific instructions from the Senate Finance Committee currently working on the Reciprocal Trade Agreements Act extension bill, the Tariff Commission has announced it will hold two sweeping investigations into the effects of foreign competition on domestic production of mercury and tungsten. The mercury hearings will get under way late this month, the probe of tungsten early next month.

These are broad and general moves by the Commission, entirely apart from escape clause recommendations. Meanwhile, the President held up his decision on the Commission's recommendations for higher traiffs and quotas on lead and zinc, pending Congressional action on the Seaton subsidy program.

ITC Invites Russia In

THE WORLD TIN MARKET was set abuzz late last month, when the International Tin Council announced it had agreed to invite Russia to join as a producing nation, and would extend invitations of membership to the U.S., West Germany and Japan as consumers.

Washington reaction was cautious. The State Department is taking a new look at commodity agreements, particularly on coffee, copper, lead and zinc. But Washington has never officially sanctioned the tin agreement.

Late Developments

OFFICE OF DEFENSE MOBILIZATION has combined with the Federal Civil Defense Administration to become the new Office of Defense and Civilian Mobilization. It will be headed by the present FCDA chief Leo A. Hoegh; Gordon Gray moving over as national security adviser to the President. No change in policy will affect the mining industries. The merger merely pinpoints the Administration's new emphasis on the nuclear short war theory of stockpiling for civilian needs, rather than on acquiring military stocks of metals.

Labor This Month

MINE-MILL APPEALS TO CONGRESS: The anti-recession fight by leaders of the Mine-Mill and Smelter Workers goes on still undaunted—and still unsuccessful. The latest plea is one made before a Congressional committee by vice president Orville Larson and secretary-treasurer Albert J. Pezzati. It includes many remedies but with special emphasis on these two points: one for the union, one for the industry.

Said witnesses Larson and Pezzati: Apply tariff protection against the importation of foreign copper and give Federal aid to Mine-Mill members the same as farmers because they too are in depressed areas.

Despite Mine-Mill's continuing efforts against the recession, there are no current signs that MMSW problems are easing. Unemployment among the membership is still gaining. The union officials now warily anticipate month-long layoffs—or more—in the period ahead. These would be in addition to the already-sizable jobless ranks in non-ferrous industry.

UNION BOYCOTTS ARE TRIMMED: The favorite union device of "hot cargo" contracts—used particularly in the trucking and construction industries—is being overhauled. The old practice where a union succeeded in negotiating such a contract—and then demanded that it be applied—is now out-of-bounds legally. The Supreme Court says an employer can sign such a contract, where his workers can refuse to handle goods of another employer with whom they have a dispute. But, while this is legal, the union cannot seek to enforce it. Taft-Hartley bans employee pressure in applying a secondary boycott. Therefore, says a key High Court ruling, employers don't have to follow the terms of a "hot cargo" clause even if they sign it. And the union can't use economic muscle to apply the boycott; it's limited to persuasion.

LABOR LEADERS ESCAPE CRACKDOWN: Whatever comes out of Congress this session on anti-racketeering legislation, it isn't going to worry union officials. Their advance fears that a tough, new Taft-Hartley bill would be passed in the wake of corruption revelations against unions didn't come to pass in the Senate. And it won't in the House,—if the House passes anything at all. The only chance this session is for a moderate anti-rackets bill—with no new curbs on boycotts, union political activity, or union security. These were the issues that union officials thought would be railroaded through Congress, but they guessed wrong.

As a matter of fact, by limiting the bill mostly to the corruption issue, its sponsors gave it the best chance of getting to the White House this year. The House Labor Committee and its North Carolina chairman Graham Barden, have shown no general interest in the subject. But, with the measure winning some sizable support in the Senate, they were almost forced out of their shell. At least it has a chance. And, there's a moral for legislators here. Don't try a clamp-down on labor in an election year, no matter how good the chances seem. The unions are still too strong, despite the corruption blows to their reputations, to be counted out before Congress.

BUT THE RACKETEERING ISSUE IS FAR FROM OVER: Even if President Eisenhower signs a bill this year, the subject won't be forgotten. The McClellan rackets investigating committee, which has been in business for two years, has a lot more revelations about union behavior coming up. Among the targets are some of the biggest unions: the hotel and restaurant workers, the carpenters, laborers and others. There's enough material already in the Committee files, say McClellan aides, to keep the probe going for five more years.

It's conceivable that labor leaders would fare better by having a new labor bill passed this year—even though they object to any new legislation. With its limited requirements on financial reports and secret ballot elections, the current proposal doesn't hurt much. But, if new committee exposures are startling, and no Taft-Hartley bill gets through this session, it will be up again next year. And then, in a non-election year, it could have stricter rules and hurt more in the labor camp.

MARKETS

Aid to Mineral Firms? Copper Prices Diverge. Zinc Premium Cut?; Lead Cut

Non-ferrous metal prices in June, as measured by the E&MJ index, rose to 164.73% of the 1922-24 average from 164.65 in May. The slight rise in copper more than offset the fall in lead.

Non-ferrous metal conditions, as measured by the E&MJ producer stocks-shipments ratio chart, showed 3.6 months supply held in May for the four major non-ferrous metals (copper, lead, zinc and aluminum). For May of each of the last six years, average months' supply were:

1953	1954	1955	1956	1957	1958
0.77	1.86	0.57	0.67	1.57	3.59

The four metal industries ordinarily hold on the average about one month's supply. Usually aluminum producers hold least and copper producers are next lowest, reflecting mainly the extent of integration.

Sales of copper in the U.S. and abroad changed little in June compared with May. Both jumped up near the middle of the month owing to widespread belief prices would rise considerably. After fabricators had bought perhaps 10 or 15 thousand tons more than they otherwise would, price weakening appeared and the buying dropped to less than earlier in the month and almost offset it.

Custom smelter prices rose late in May and early in June as their intake of materials were at lower levels and producers and merchants got less of the independent fabricators' business. On the 10th of June they raised to 25c, equal with the producer price in the U.S. The next day some quoted a price of 26c. London had jumped on the 11th to about 24.75c and with the premium for shapes was over the U.S. producer price. Much of the London rise reflected the expectation of price rises in the U.S. by producers; this expectation was founded largely on the firm belief the U.S. would "do something" for the copper producing industry. Most thought Congress would pass the 150,000-ton copper stockpiling proposal by the Administration (which replaces the copper part of the subsidy bill described here last month) and that this would provide the occasion for the producers to raise the price, possibly to the 27½c price the Government would pay. There was much short covering both on the LME and the N.Y. Commodity Exchange.

At the high prices outside the U.S. merchants were unable to buy metal and import it into the U.S. Some still had copper coming in on earlier pricing arrangements. These developments brought about an unusual situation.

Anaconda raised its price delivered to U.S. buyers to 26½c a lb effective June 17 from the 25c price. Its fabricating subsidiaries also raised their price basis to 26½c. But no other producer followed Smelters went to 26½c—but stayed only a short time—they sold some at 26½c the rest of the week but Monday the 23rd they were at 25½c. But Anaconda maintained the 26½c price—for its metal sales; its subsidiaries were back on the 25c basis for sales of fabricated products. This, according to some observers, was an incongruous situation.

Many factors felt the other producers were waiting for either more positive assurance the Government would buy the 150,000 tons or the imposition, automatically, of the 1.7c U.S. import duty on July 1. But analysts guessed the others would wait for the real pickup in consumer business. They suggested the other large producers were financially better able to ride out the recession in the metal markets. Also, they indicated the 150,000 tons would still leave U.S. producer stocks higher than "normal"

Phelps Dodge raised to 26½c on July 2. Kennecott was still at 25c on July 7.

Officials of some copper companies, though sure the Senate would accept the 150,000 stockpile proposal, were doubtful the House would. Mining states have a high proportion of Senators but a low proportion of Representatives. They also believe Congress will not adjourn before early August and that a final decision will not be known before then.

Copper scrap prices, which had risen somewhat with the smelters' copper selling price, had dropped back. Katanga, which had upped its price to 25.9c, dropped to 24.95c June 24.

Belief was widespread that a great effort had been made to get the price up but that the "real" conditions to support it were not present. Feeling persisted that efforts were not ended and that the U.S. Government would bring about prices acceptable to mining firms.

Statistics released for May by the Copper Institute showed no significant change from April. Stocks held by producers and refiners in the U.S. in May of each of the last six years, relative to May shipments of each year, were:

1953	1954	1955	1956	1957	1958
0.36	0.74	0.35	0.39	1.28	3.22

U.S. copper fabricator shipments rose a little in May but unfilled orders and sales fell. Their stock-shipments ratio was:

1953	1954	1955	1956	1957	1958
2.9	3.4	2.9	3.6	3.8	5.0

E&MJ dropped the foreign copper price quotation for Saturdays—the one major producer that had been reporting Saturday sales to E&MJ, Katanga, stopped quoting Saturday prices in June.

Lead and zinc subsidies were proposed by the Senate Interior Subcommittee. They raise the amounts proposed in the Administration bill. The latest Senate and Sec. Seaton proposals, in cents per lb, follow:

	A	B	C	D	E	F
Lead						
Senate	14.17	4.0	=75%	of 5.33	10.17	15.5
(500)	15.3	5.129	=75%	of 6.83	10.17	17.0
Seaton	13.63	3.375	=75%	of 4.5	10.25	14.75
(500)	15.31	5.0625	=75%	of 6.75	10.25	17.0
Zinc						
Senate	10.23	4.0	=55%	of 7.27	6.23	13.5
(500)	10.79	4.557	=55%	of 8.27	6.23	14.5
Seaton	10.71	2.5	=55%	of 4.545	8.205	12.75
(500)	11.67	3.4625	=55%	of 6.295	8.205	14.5

A is the maximum amount per lb the producer will get when the market price is the highest compatible with the maximum subsidy. B is the maximum subsidy. C is the percent of the price of refined metal which is assumed attributable to the mining and milling part of producing metal. D is the amount the subsidy would be if not only the mining but also the smelting and refining activities were subsidized to the same extent. E is the highest price of metal on the market at which the mining firm will get the maximum (B) subsidy. If the price dropped below E the mining firm would still get B. F is the sum of D and E; it shows a market price such that the increment over the maximum subsidy market price (E) would give the mining activity the amount of increment equal to the maximum subsidy (B). (500) refers to the provision that for 500 tons per quarter all firms, large and small, will get higher subsidies. Columns B and F are the ones that have been most discussed, but it would appear A is more significant than F.

The Interior points out that aid for mineral and other industries could best be called "transfer payments." In the case of Government subsidies they are transfers from tax-based funds to certain aided industries. Tariffs or import taxes are transfers from the consumer to the aided industries (owing to the higher price he pays) and also from consumer to Government (through the tax).

Lead was raised by a major smelter to 11½c New York late on June 18; others followed. The rise reflected the higher prices on the LME and the profitability of shipping metal to Europe versus shipping it to the U.S. But it was all ultimately based on the conviction the U.S. Government would do something for lead. But the subsidy proposals would tend to reduce foreign prices. On June 31 lead dropped back to 11c.

Reports of cuts in the 1¼c premium for Special High zinc are prevalent.

Aluminum producers have asked the Government to stockpile 150,000 tons of aluminum at 27c a lb. They feel Government aid to other metals may permit those metals to be sold at lower than normal prices and thus displace aluminum. But Seaton said aluminum is not a domestic mining industry. He is, of course, right—only about 6% of the value of primary aluminum is in the ore, bauxite. And much of that is imported. Other non-ferrous metals have usually 40 to 60% of their value in the ore and concentrate.

Average Prices June (*E&MJ Quotations*)

Copper:

Electrolytic, domestic refinery ..	24.689
Electrolytic, export refinery ...	23.670

Lead:

Common, New York	11.224
Common, St. Louis	11.024

Silver and sterling exchange:

Silver, New York, per oz.	88.625
Silver, London, pence per oz. ..	75.274
Sterling Exchange	281.111

Zinc:

Prime, Western, East St. Louis	10.000
Prime, Western, delivered (g) ..	10.500

Tin:

New York Straits	94.665
Gold per oz. U. S. price	$35.000
Quicksilver, per flask	$228.120
Antimony, (E&MJ) (d)	32.590
Antimony, bulk, Laredo	29.000
Antimony, in cases, Laredo .	29.500
Platinum, refined, per oz. ...	$67.000
Cadmium (a)	155.000
Cadmium (b)	155.000
Cadmium (c)	155.000
Aluminum, 99% plus ingot ..	26.100
Magnesium, ingot	35.250
Nickel (f)	74.000

Domestic quotations, unless otherwise stated, are in cents per pound. Sterling exchange checks, in cents. Quicksilver, per flask of 76 lb.

(a) Cadmium average based on the producers quotations.

(b) Cadmium average based on the average of the producers' and platers' quotations.

(c) Cadmium average based on platers' quotation.

(d) Domestic 5 tons or more but less than carload lots, packed in case f.o.b. New York.

(f) Contract price, f.o.b. Port Colborne U.S. duty included.

(g) Delivered where freight exceeds 0.5c.

"Free" Gold Market

Volume increased 180% as gold trading rose to a record postwar high. U.S. gold outflow continued. There were unprecedented sales by the French public under the new gold-linked government bond issue. London and Swiss centers were also very active. Again, no Soviet sales were reported. Bombay listed the world's highest prices for gold coins, $60.25 per oz. Pick's World Currency Report quotes on "free gold" per fine oz as follows:

	COINS		BARS (12.5 kg)	
	May 31	June 30	May 31	June 30
NEW YORK, transit	.....	.....	$35.08⅛	$35.08⅛
MANILA	$42.00	$41.75	36.00	35.75
HONG KONG	46.50	46.95	38.50	38.35
BOMBAY	61.75	60.25	59.75	57.50
TANGIER	40.75	40.50	35.22	35.20
BEIRUT	41.12½	41.35	35.25	35.25
PARIS	41.15	40.25	36.66	36.15
BUENOS AIRES	38.65	38.80	36.50	36.40

Note: Prices are quoted at the free or black market value of the U. S. dollar in the local markets.

Custom Smelter Copper Price

Based on flat price and E&MJ-average price sales in U. S. for month of May reported by American Smelting & Refining Co.: electrolytic copper in standard shapes, adjusted to nearest ⅛c; ¼c deducted for selling commission.

Delivered Consumers' plant	24.625 lb
F.o.b. refinery	24.225 lb

Major Metals

U. S. DAILY AND AVERAGE PRICES

June 1958	Electrolytic Copper (a) Domestic	Electrolytic Copper (b) Export	Lead New York	Lead St. Louis	Zinc (f) Delivered	Zinc East St. Louis	Aluminum Primary Pig 99%	Straits Tin New York
2	24.175	22.325	11.500	11.300	10.500	10.000	24.000	94.500
3	24.400	22.425	11.000	10.800	10.500	10.000	24.000	94.500
4	24.425	22.550	11.500	10.800	10.500	10.000	24.000	94.500
5	24.475	22.425	11.000	10.800	10.500	10.000	24.000	94.750
6	24.550	22.525	11.000	10.800	10.500	10.000	24.000	95.000
7	No Market	No Market	11.000	10.800	10.500	10.000	24.000	95.000
9	24.500	22.850	11.000	10.800	10.500	10.000	24.000	95.125
10	24.600	23.025	11.000	10.800	10.500	10.000	24.000	94.875
11	24.775	23.150	11.000	10.800	10.500	10.000	24.000	94.625
12	24.625	23.675	11.000	10.800	10.500	10.000	24.000	94.625
13	24.700	24.550	11.000	10.800	10.500	10.000	24.000	94.500
14	No Market	No Market	11.000	10.800	10.500	10.000	24.000	94.500
16	24.775	24.525	11.000	10.800	10.500	10.000	24.000	94.250
17	25.225	24.625	11.000	10.800	10.500	10.000	24.000	94.625
18	24.775	25.125	11.110	10.910	10.500	10.000	24.000	94.750
19	24.750	24.875	11.500	11.300	10.500	10.000	24.000	94.875
20	24.925	24.250	11.500	11.300	10.500	10.000	24.000	94.625
21	No Market	No Market	11.500	11.300	10.500	10.000	24.000	94.625
23	24.875	23.925	11.500	11.300	10.500	10.000	24.000	94.500
24	24.775	23.850	11.500	11.300	10.500	10.000	24.000	94.625
25	24.700	23.850	11.500	11.300	10.500	10.000	24.000	94.750
26	25.000	24.275	11.500	11.300	10.500	10.000	24.000	95.000
27	24.750	24.100	11.500	11.300	10.500	10.000	24.000	94.500
28	No Market	No Market	11.500	11.300	10.500	10.000	24.000	94.500
30	24.700	24.175	11.500	11.300	10.500	10.000	24.000	94.500
AVERAGES FOR MONTH								
June	24.689	23.670	11.224	11.024	10.500	10.000	24.000	94.665
AVERAGES FOR WEEK								
June								
4	24.344	22.221	11.300	11.100	10.500	10.000	24.000	94.600
11	24.580	22.795	11.000	10.800	10.500	10.000	24.000	94.896
18	24.820	24.500	11.018	10.818	10.500	10.000	24.000	94.542
25	24.805	24.150	11.500	11.300	10.500	10.000	24.000	94.667
CALENDAR WEEK AVERAGES								
June								
7	24.405	22.450	11.083	10.883	10.500	10.000	24.000	94.708
14	24.640	23.450	11.000	10.800	10.500	10.000	24.000	94.708
21	24.890	24.680	11.268	11.068	10.500	10.000	24.000	94.625
28	24.820	24.000	11.500	11.300	10.500	10.000	24.000	94.646

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis. All prices, except gold and silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.400c per pound, the average differencial for delivery charges.

(b) Our export quotations for copper reflect prices obtaining in the open market and are based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.125c for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingots; cathodes are sold at a discount of 0.125c to 0.15c per pound. Quotations for zinc are based on Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East, Middle West, and West effective April 9, 1958, commanded a premium of 1c per pound over the current market for Prime Western; Special High Grade 1.25c effective April 9, 1958.

(f) Prime Western delivered where freight from E. St. Louis exceeds one-half cent.

Quotations for lead are based on domestic common lead. Corroding lead commands a premium of 10 points (almost all U. S. lead is corroding grade).

(c) The daily silver quotation reported by Handy & Harman, in cents and fractions of a cent per troy ounce, is the price paid by Handy & Harman in settlement for silver contained in unrefined silver-bearing materials submitted to them for refining. It is determined on the basis of offers of bar silver .999 fine as made to Handy & Harman for nearby delivery at New York by regular suppliers in quantities sufficient to meet daily requirements, and it is usually one quarter cent below the price at which such offers are made.

The Treasury's purchase price of newly mined domestic silver is 90.5 per troy ounce 1000 fine effective July 1, 1946. London silver in pence per troy ounce, basis .999 fine.

(d) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

June 1958	Silver (c) New York	Silver London	Sterling Exchange	Gold London	Gold (d) United States
2	88.625	75.875d.	281.6875	249s. 3½d.	$35.00
3	88.625	75.875d.	281.5937	249s. 4d.	35.00
4	88.625	75.875d.	281.6187	249s. 3¾d.	35.00
5	88.625	75.875d.	281.5312	249s. 4¼d.	35.00
6	88.625	75.500d.	281.4062	249s. 6½d.	35.00
7	(e)	(e)	(e)	(e)	35.00
9	88.625	75.500d.	281.4500	249s. 5¾d.	35.00
10	88.625	75.500d.	281.3125	249s. 5½d.	35.00
11	88.625	75.250d.	281.3125	249s. 6¼d.	35.00
12	88.625	75.250d.	281.4062	249s. 6½d.	35.00
13	88.625	75.250d.	281.4375	249s. 4½d.	35.00
14	(e)	(e)	(e)	(e)	35.00
16	88.625	75.250d.	281.4062	249s. 4½d.	35.00
17	88.625	75.250d.	281.1437	249s. 5d.	35.00
18	88.625	74.750d.	280.9062	249s. 7½d.	35.00
19	88.625	74.750d.	280.9687	249s. 11¼d.	35.00
20	88.625	75.000d.	281.0312	249s. 8d.	35.00
21	(e)	(e)	(e)	(e)	35.00
23	88.625	75.000d.	281.0312	249s. 9d.	35.00
24	88.625	75.000d.	280.6875	249s. 11¼d.	35.00
25	88.625	75.000d.	280.5625	250s. 1¼d.	35.00
26	88.625	75.000d.	280.2687	250s. 4d.	35.00
27	88.625	75.000d.	280.2250	250s. 8⅛d.	35.00
28	(e)	(e)	(e)	(e)	35.00
30	88.625	75.000d.	280.3437	250s. 4d.	35.00
AVERAGES FOR MONTH					
June	88.625	75.274	281.111	—	$35.00
AVERAGES FOR WEEK					
June					
4	88.625	—	281.616	—	$35.00
11	88.625	—	281.402	—	35.00
18	88.625	—	281.260	—	35.00
25	88.625	—	280.856	—	35.00

Calendar Week Averages: New York Silver: June 7th, 88.625; 14th, 88.625; 21st, 88.625; 28th, 88.625.

(e) No Market (Saturday).

MARKETS *(Continued)*

London Metal Exchange Quotations

	COPPER				LEAD				ZINC				TIN			
	Cash		3 Mo.		Current Month		3 Mo.		Current Month		3 Mo.		Cash		3 Mo.	
June	Bid	Asked	Bid	Asked	Bid	Asked	Bid	Asked	Bid	Asked	Bid	Asked	Bid	Asked	Bid	Asked
2	181½	181¾	184¼	184½	71¼	71½	71¾	72	61¾	62	62¼	62½	730	730½	732½	733
3	183¼	183½	186¼	186½	71½	72	72	72¼	62⅝	62½	63	63¼	730	730½	733	733½
4	184¼	184½	187¼	187½	71½	71⅝	72	72⅛	63	63¼	63¼	63½	730	730½	733	733½
5	183¼	183½	185¾	186	71½	71⅝	71⅞	72	62⅝	62¾	62¾	63	730	730½	734½	735
6	184¾	185	187¼	187¾	71½	71⅝	71⅞	71¾	62⅝	62½	62⅝	62⅞	730	730½	734½	735
9	187	187¼	189¼	189½	70⅝	71	71½	71½	62½	62½	62½	62¾	730	730½	735	735½
10	189½	189¾	192¼	192½	70⅝	70¾	71¼	71½	62¼	62½	62½	63	730	730½	734½	735
11	197¾	198¼	200	200½	71¼	71⅝	72	72⅛	62⅞	63	63⅛	63¾	730	730½	734½	735
12	199	199¼	201	201½	74	74¼	75¼	75½	65½	65¾	65⅞	66	730	730½	734	734½
13	200	200¼	202	202½	72¼	72⅝	73¾	73⅞	64	64½	64¾	64⅞	730	730½	732½	733
16	200½	201	201½	202	72⅝	73	73⅝	73½	64	64½	64¾	64¾	730	730½	729	729½
17	204¼	204¾	205½	205¾	73¼	73½	74½	74¾	65	65¼	65⅝	65¾	730	730½	728	728½
18	205½	205¾	206¼	206½	77	77¼	77⅞	78	67¼	67½	67⅞	68	730	730½	732	732½
19	203½	204	204¼	204½	77¾	78¼	79	79¼	66	66¼	66⅝	67	730½	731	733½	734
20	198	198¼	198¾	199	73½	73¾	74¾	75	63¾	64	64½	64½	730	730½	731½	732
23	194½	194¾	195½	195¾	74	74¼	75¼	75½	65	65½	65½	65¾	730	730½	731½	732
24	196½	196¾	196¾	197	74½	74¾	75¾	76	65	65½	65½	65¾	730	730½	731½	732
25	196½	196¾	196¾	197	75	75½	76	76¼	65½	65¾	65⅞	66	730	730½	732	732½
26	199	199¼	199½	199¾	75	75½	76	76¼	65½	65¾	66⅛	66¼	730	730½	733	734
27	198	198¾	199¼	199½	75	75½	76¾	76½	65½	65¾	66⅛	66¼	730	730½	732	732½
30	197	197¼	197¼	197¾	72¼	72½	74	74¼	63½	64	64	64¼	730	730½	732	732½
Av'g's.	£194.613		£196.186		£73.277		£74.155		£64.176		£64.652		£730.274		£732.833	

Prices are for the official a.m. session in pounds sterling per ton of 2240 lb. Copper basis wire bars, lead 99.97%, zinc 98% and tin min. 99.75%.

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipments f.o.b. New York unless otherwise stated. tons of 2,000 lb. unless otherwise noted. St—short ton; lt—long ton. (p) duty paid.

MISCELLANEOUS METALS

June 30, 1958

Aluminum ingot, 99 plus % lb.			26.1¢
Antimony, spot, lb. less than carload, in cases			32.59¢
In bulk, carload lots, f.o.b. Laredo			29.00¢
Imported, 10 ton min. (p), 99½%			23¢
Bismuth, ton lots, lb.			$2.25
Cadmium, commercial sticks, delivered, lb.			$1.55
Calcium, lb. ton lots, 98%, cast			$2.05
Chromium, 97% grade, lb. contract del.			$1.29
Cobalt, 97 to 99%, per lb. eff. Feb. 1, 1957			$2.00
Germanium, per gram, 10,000 gram lots	(c)38¢	@	(d)45½¢
Indium, troy oz.	$1.25	@	$2.25
Lithium, lb. 98%	$9.00	@	$11.00
Nickel, cathodes, lb (a)			74¢
Other sales, reg. sellers			74¢
Sales by dealers, etc.			74¢
Magnesium, 99.8% carloads, lb. producer's plants, Velasco, Texas, eff. Apr. 16			35¼¢
Palladium, troy oz.	$17.00	@	$19.00
Platinum (wholesale lots), troy oz.	$62	@	$70
Quicksilver, flask of 76 lb., 25 flasks or more	$228	@	$231
Selenium, 99 plus %, lb—(Feb. 19, 1958)			$7.00
Silicon, minimum 97%, carloads, lb.			21¢
Semi-Conductor grade, lb.			$350
Tellurium, lb.			$1.65
Thallium, 100 lb. or more, lb.			$7.50
Titanium, 99.3 plus, grade A-1, max. 3% iron, lb. (b)			$2.05

(a) Eff. Dec. 6, 1956; incl. U. S. duty; (b) Effective April 1, 1958.
(c) Delivered; (d) f.o.b. plant.

METALLIC ORES

Beryllium Ore, imported, 10% BeO, per short ton unit	$34.00	@	$35.00
Chrome Ore per long ton, f.o.b. cars Atl. ports, dry:			
44% Cr_2O_3 no ratio	$24	@	$25
48% Cr_2O_3 3 to 1 ratio	$46	@	$55
Iron Ore, Lake Superior, Lower Lake ports, long ton:			
Old Range bessemer			$11.85(e)
Mesabi bessemer			$11.60(e)
Mesabi, non-bessemer			$11.45(e)
Lead (Galena), 80%, Joplin, Mo., ton			$127.32
Manganese Ore—Per long ton unit of Mn basis 48% manganese, nearby positions, subject to premiums and penalties, c.i.f. U. S. ports, import duty extra, export duty included $1.10 @ $1.15; both duties excluded, $.965 @ $1.015. Long-term contract nominal.			
Molybdenum Ore, 90%, per lb. of Mo f.o.b. mines	$1.18	@	$1.23
Columbium-Tantalum, per lb., combined oxides 10 to 1 ratio	$1.05	@	$1.10
Tungsten Ore, per stu of WO_3:			
Foreign 60%, c.i.f. U. S. ports, duty extra	$9	@	$11
U. S. scheelite, f.o.b. mill	$17	@	(a)$22
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines			31¢
Zinc Ore, Prime, 60% concentrate, Joplin, Mo., per ton.			$56

(a) Nominal.
(e) Eff. 1958 shipping season.

METALLIC COMPOUNDS

Arsenous Oxide (arsenic trioxide) lb., in bbl. carload lots delivered			5¾¢
Cobalt Oxide, 72¼% to 73¼%, per lb. eff. Dec. 1, '56	$1.52	@	$1.55
Copper Sulphate, 100 lb eff. Jan. 13, '58			$10.70
Germanium Oxide, gram			27½¢
Molybdic trioxide, technical, per lb. of Mo	$1.38	@	$1.41
Imported, incl. 37¢ duty	$1.75	@	$2.05

ALLOYS

Ferrochrome 65 to 70%, per lb. of Cr. (4-9% C)			28¾¢
Ferromanganese, 74 to 76%, per lb., shipg. pt.			12¼¢
Ferromolybdenum, 58 to 64% Mo, lb. of Mo contained	$1.68	@	$1.74
Ferrosilicon, 50% per lb. of Si f.o.b. shipping point (3-19-57)			14.20
Ferrotungsten, 72 to 82%, lb. of W contained			$2.15
Ferrovanadium, per lb, of V delivered	$3.20	@	$3.40
Silicomanganese, max. 1½% carbon, lb., contracts			12.8¢
Spiegeleisen, per long ton, 10 @ 21% grade eff. Jan. 7			$102.50

NON-METALLIC MINERALS

Asbestos, f.o.b. Canada (Quebec) mines (Canadian funds) ton:			
Crude No. 1	$1,470	@	$1,810
Crude No. 2	$788	@	$1,155
Spinning fibers	$353	@	$593
Shingle fibers	$190	@	$220
Paper stock	$120	@	$142
Waste	$82	@	$86
Shorts	$27	@	$75
Asbestos, f.o.b., Vancouver, B. C. (Canadian funds):			
Crude No. 1			$1,522
Spinning fibers	$494	@	$787
Shingle fibers	$142	@	$325
Asbestos, Vermont, f.o.b. Hyde Park:			
Spinning fibers	$353	@	$383
Shingle stock	$172	@	$190
Paper stock	$114	@	$145
Waste, stucco or plaster			$82
Refuse or Shorts	$39	@	$72
Barytes f.o.b. cars:			
Georgia, crude, per ton			$18
Missouri, 94% $BaSO_4$, per short ton	$16	@	$18
Crude oil well grade, min. 4.3% sp. gravity, st (a)			$18
Imported, c.i.f. Gulf Ports, st	$16	@	$18
Bauxite, long ton, f.o.b. point of shipment:			
Domestic, crude, 50 to 52% (not dried)	(c)$ 5.00	@	$5.50
Domestic, chemical, 55 to 58%	(c)$ 8.00	@	$8.50
Domestic, abrasive, 80 to 84%	(c)$18.00	@	$18.50
Imported metallurgical, per lt, f.o.b. Br. Guiana, dep. on grade			$7.14
Feldspar, bulk ton:			
Potash or soda feldspar, 200 mesh, ceramic grade	$18.50	@	$22.50
Glass feldspar, white, 20 mesh	$10	@	$12.50
Fluorspar, f.o.b. mines, bulk, 72½% effective, ton	$37	@	$41
60% effective CaF_2	$33	@	$36.50
Acid 97% concentrate, bulk, ton (eff. 12-1-56)			$50.00
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00	@	$14.00
Magnesite, per ton dead-burned, bulk, f.o.b. Washington			$46
Mica—Domestic, f.o.b. mines. Punch 7¢ to 12¢ per lb. according to size and quality. Sheet clear, 1½ x 2-inch, 70¢ to $1.10; 2 x 2-inch, $1.10 to $1.60; 2 x 3-inch, $1.60 @ $2.10; 3 x 3-inch, $1.80 @ $2.30; 3 x 4-inch, $2.00 @ $2.60; 3 x 5-inch, $2.60 @ $3.00; 4 x 6-inch, $2.75 @ $4.00; 6 x 8-inch, $4.00 @ $8.00. Wet ground, very fine, $140 @ $155 per ton. Bulk sales, dry ground; $30 @ $55 per ton. Scrap, $20 @ $30.			
Ocher, Georgia, ton, in sacks	$26.50	@	$32.00
Pyrites, Spanish, per long ton unit of S. c.i.f. atlantic ports			Not quoted
Sulphur, per lt, f.o.b. U. S. mines: bright			$23.50
dark			$22.50
Mexican, for use in Mexico, per metric ton, f.o.b. mines, 280 to 395 pesos, depending on use	$22.40	@	$31.60
For export f.o.b. vessel, lt, dep. on grade	$22	@	$24
Talc, f.o.b. works, ton:			
New York, purified	$18.00	@	$20.00
Vermont, extra fine			$12.50
Tripoli, Missouri, ton:			
40-mesh, cream colored			$50.00

(a) Some restricted sales at $11.50. (b) Corrected. (c) Nominal.

IRON AND STEEL

Pig Iron, gross ton, basic, Valley Furnaces			$66.00
Steel, f.o.b. Pittsburgh, billets, net ton			$77.50
Structural shapes, Pa., Ala., etc, 100 lb	$5.10	@	$5.275

you can make over 250 different cable connections–

with O-B Cap Screw Connectors!

Straight-Thru Connector

Three-Way Connector Plate

Tee Connector

Actually, you can make a total of 259 different cable connections with the complete line of O-B "Cap Screw" Cable Connectors—and make all 259 with the same ½-inch hex wrench!

You can join copper to copper, copper to aluminum, or aluminum to aluminum cables, same size or different size, to make straight-thru, tap off, or three way connections wherever and whenever needed—faster than ever before possible!

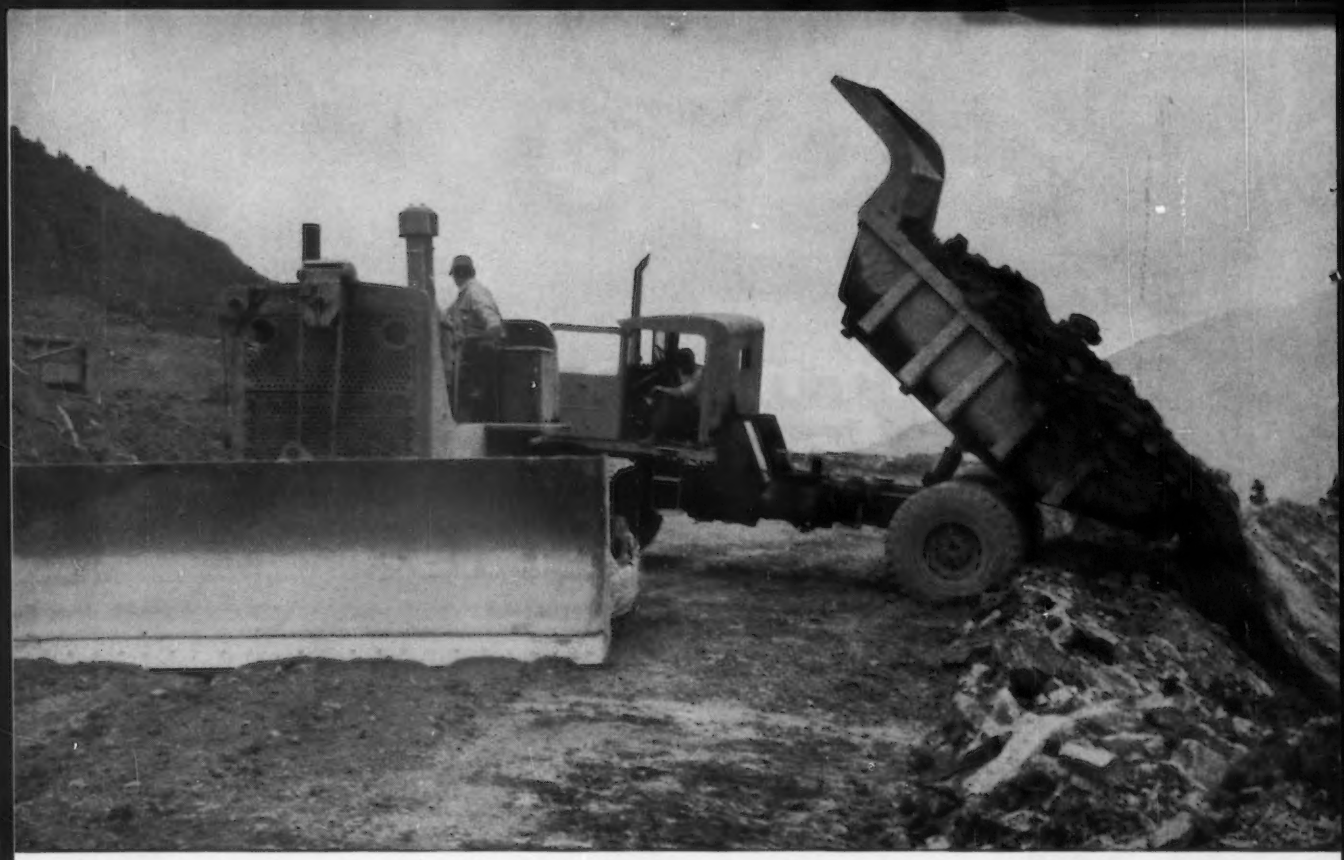
All connections have high mechanical strength, high current-carrying capacity. All can be easily taped, dragged over rough bottom without snagging.

Ask your local O-B representative or write today for complete information on these time-, labor-, and money-saving O-B Cap Screw Connectors!

OHIO BRASS COMPANY • MANSFIELD, OHIO
Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

Ohio Brass

4833-M



The dozers, trucks and shovels used at this strip mine in Alaska are made from High Strength Steel. They work all winter in sub-zero weather and even in the summer must dig through permanently frozen ground.

USS High Strength Steel rips through rock at 30 degrees below zero!

Edwards, Nesmith, Ryder, Inc. operates a strip mine in Alaska. It's a hundred miles into the bush and it often takes a year to get heavy replacement parts there. But they haven't had a shutdown since they started in 1953. Why? Their shovels, dozers and trucks are made from High Strength Steel.

Says President and Business Manager Wesley Edwards, "Our equipment has to work every month of the year, and we dig ground that's frozen solid a foot below the surface even in summer. During the winter we have an extra problem—the temperature goes down to 30 degrees below zero. When it's that cold and you have to rip through this sandstone and bone seam, you can crack steel blades pretty easily.

"But, we've had no trouble at all with our equipment made of High Strength Steel. It has actually cut through a mountain of ice and rock to open the sixty-foot vein we're working now."

High Strength Steel handled this job because it's stronger and tougher than structural carbon steel which is still being used in some earthmoving equipment. High Strength Steel has a yield point 50% higher than that of structural carbon steel and it has more resistance to wear, impact, abrasion and atmospheric corrosion.

United States Steel produces three brands of High Strength Steel—COR-TEN Steel, MAN-TEN Steel and TRI-TEN Steel. Each has a specific combination of characteristics that is best for certain jobs.

For more information, write: United States Steel, 525 William Penn Place, Pittsburgh 30, Pa., or contact our District Sales Office.

. . .

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American Steel & Wire – Cleveland
Columbia-Geneva Steel – San Francisco
Tennessee Coal & Iron – Fairfield, Alabama
United States Steel Supply – Steel Service Centers
United States Steel Export Company

USS United States Steel

Stockpiling

...a continuing company policy established years ago

Stockpiling is a measure of service.

The government is stockpiling strategic materials for its long range defense program. Thus, it serves the citizenry. The producer of a raw material who as a company policy stockpiles also serves . . . serves its customers who in turn serve others by being able to count on a supply of the raw material in quantity.

The policy of Texas Gulf Sulphur Company has always been to stockpile . . . always producing *extra* for the future. In spite of the growing demands for the important basic material it produces—Sulphur . . . the company's policy has been to keep on hand stocks equal to about a year's normal demand. With such a supply, it can make shipments, routine or emergency, of any tonnage, at any time, by any method.

Texas Gulf Sulphur Co.

75 East 45th Street, New York 17, N. Y.
811 Rusk Avenue, Houston 2, Texas

Sulphur Producing Units

Newgulf, Texas
Moss Bluff, Texas
Spindletop, Texas
Worland, Wyoming

B.F.Goodrich

Why miners choose B.F.Goodrich tires

for the really tough jobs!

THE trucks above haul 20 to 25-ton loads out of a Pennsylvania strip mine. Roads are steep, winding and strewn with jagged pieces of rock. These rugged operating conditions once caused tire blowouts, premature failures and sky-high costs. Then the truck operator switched to the tires you see—B.F.Goodrich Rock Service tires. The report: B.F.Goodrich Rock Service tires "take it" so well they can be *retreaded again and again!*

This experience is typical. Miners report longer, trouble-free service and more retreads with B.F.Goodrich Rock Service tires. The B.F.Goodrich FLEX-RITE NYLON cord body withstands double the impact of ordinary cord materials, resists heat blowouts and flex breaks. This Rock Service body outwears even the extra-thick tread, can be retreaded over and over!

Husky Rock Service cleats grip the ground to give positive traction in forward or reverse. Take a tip from miners on the really tough jobs—switch to new B.F.Goodrich Rock Service tires with FLEX-RITE NYLON cord body. See your B.F.Goodrich dealer today—he's listed under Tires in the Yellow Pages of your phone book. *B.F.Goodrich Tire Co., A Division of The B.F.Goodrich Co., Akron 18, Ohio.*

Specify B.F.Goodrich Tubeless or tube-type tires when ordering new equipment

B.F.Goodrich *truck tires*

© The B.F. Goodrich Company

Why the rugged Caterpillar No. 12 is a key machine on any team!

With a long-standing reputation as the "machine that stays full time on the tough jobs," the dependable CAT No. 12 Motor Grader is easy to operate and economical to own. The No. 12 shown here is a key machine because it keeps hauling equipment rolling by maintaining haul roads on mining operations near Schefferville, Quebec. Here Iron Ore Co. of Canada is producing 12 million tons of ore per year from four groups of pits.

The Cat No. 12 Motor Grader has earned its reputation as the "standard of the industry" by handling top production, yet requiring a minimum of maintenance. For example, take the exclusive oil clutch. Constantly protected by oil, this clutch requires adjustment about once every 1,500 hours of operation. And facing wear is negligible, assuring long clutch life.

Check off these additional No. 12 features, and you'll see why owners and operators both prefer it.

Positive mechanical controls for low maintenance costs.
Quality-built constant mesh transmission for long life, less down time.
Long tandem and frame for better utilization of machine.
A powerful "matched" engine that lugs hard without fouling.
Exclusive tubeless tires that eliminate tube and flap failures.

Don't wait—get in touch with your nearby Caterpillar Dealer now. Ask him to give you a practical demonstration. Take time now to save *production* time later!

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

CATERPILLAR

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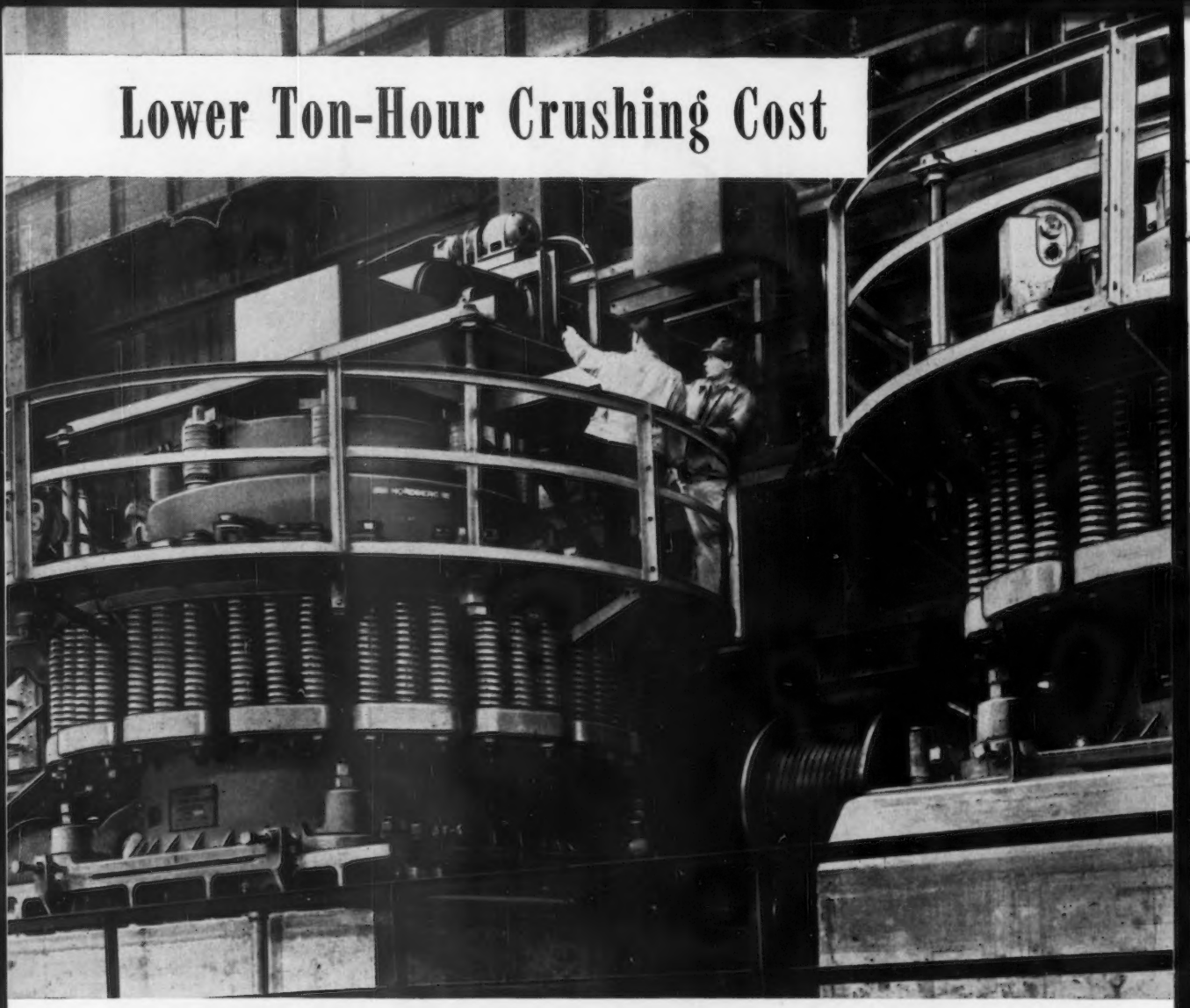
THE MACHINES THAT WORK FULL TIME

Lower Ton-Hour Crushing Cost



with SYMONS® CONE CRUSHERS

Here are some of the reasons why:

You can get up to 900 or more tons per hour per unit . . . Symons Cone Crushers consistently deliver large tonnages of crushed product. Positive setting and a carefully designed crushing cavity assures uniformity of product.

Operate with minimum supervision . . . Symons Cone Crushers require a minimum of man hours for installation, operation and maintenance. Adjustments for product size or liner wear are quickly made, and easy access to all parts makes servicing relatively easy and holds down-time to a minimum.

Ability to withstand rugged service . . . Symons Cones are of heavy duty, quality construction to meet the extremely tough service encountered in reduction crushing of all types of ores and minerals. All bearings are thoroughly lubricated by a pressure circulating system.

Full size range for primary, secondary or tertiary crushing . . . Symons Cone Crushers are built in eleven different sizes, ranging from 22″ to 7′ in diameter, for capacities of from 6 to 900 or more tons per hour. Available with fine, medium, coarse and extra-coarse cavities, to take feed up to 18″ or 20″. *For complete details, send for Bulletin 247.*

SYMONS . . . a registered Nordberg trademark known throughout the world.

NORDBERG MFG. CO.,
Milwaukee 1, Wisconsin

NORDBERG

NORDBERG MACHINERY

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C658

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call KE for plant expansion or new facilities

INGENUITY

has made KE a major engineer-contractor serving Minerals

Design of a concentrating plant to process 60,000 tons of iron ore per day. Open pit bauxite facilities. Coking coal processing plants. Diatomite plants. Cement plants. These are a few of many projects and studies Kaiser Engineers undertakes for the Minerals industries in the United States and world-wide—Quebec, Jamaica, Mexico, Brazil, Australia, New Zealand, Greece, Turkey, India.

From determination of process through design and construction of complete facilities, KE can perform any or all steps. And perform them with Ingenuity—to produce a more efficient operation, in less time, at lower cost.

For your next facility—whether ferrous, non-ferrous or non-metallic—call KE.

Pendulum ore conveyor—Ingenuity produced KE innovation distributing beneficiated iron ore in 180° crescent; conserved space, cut rehandling costs.

KAISER ENGINEERS

KAISER ENGINEERS engineers-contractors
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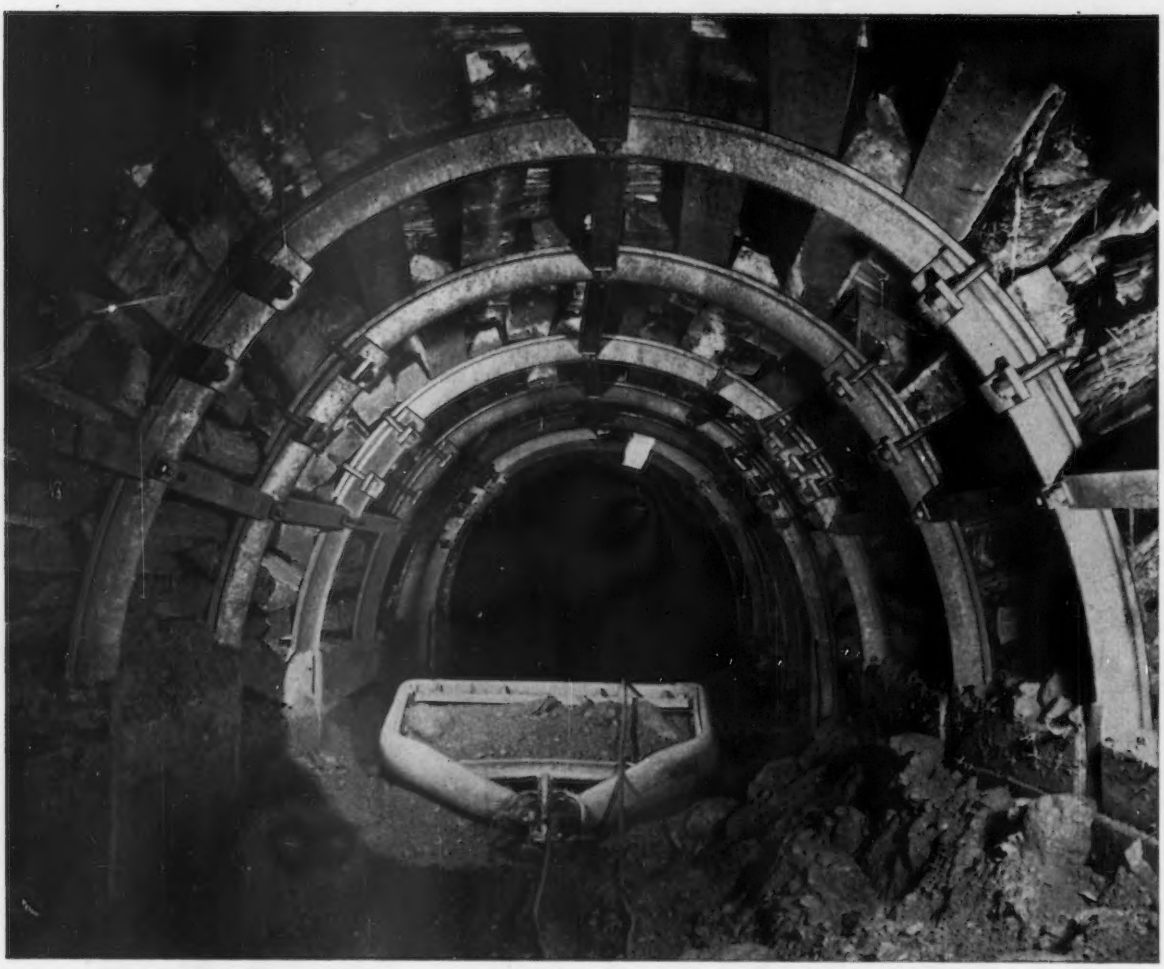


Yieldable Arches GIVE when the "squeeze" is on

Heavy or shifting ground around a mine opening always needs some form of support, to give the overburden a chance to settle naturally into a pressure arch. Mining men have found that the best type of support is one which will yield slowly to the pressures until the natural arch is formed; rigid sets simply cannot stand up under the squeeze of the dynamic forces.

HOLDS FAST UNDER NORMAL LOADS

Bethlehem's Yieldable Arch works on a principle of sliding joints, which are formed by the lapping of one U-shaped segmental steel section over another as shown in the illustration. Husky U-bolt clamps are installed in pairs over the lapped joints, and drawn up tightly enough to hold fast under normal loads. As pressures bear down, however, the arch yields, a little at a time.

PRESERVES MINE SAFETY

The more the Yieldable Arch "gives," the more the stress is transferred to the surrounding material. Eventually, equilibrium is reached and the Yieldable Arch stands pat, its structural integrity maintained and mine safety preserved. That is why you will hear it said that the yielding feature of the Arch is more important than its physical strength.

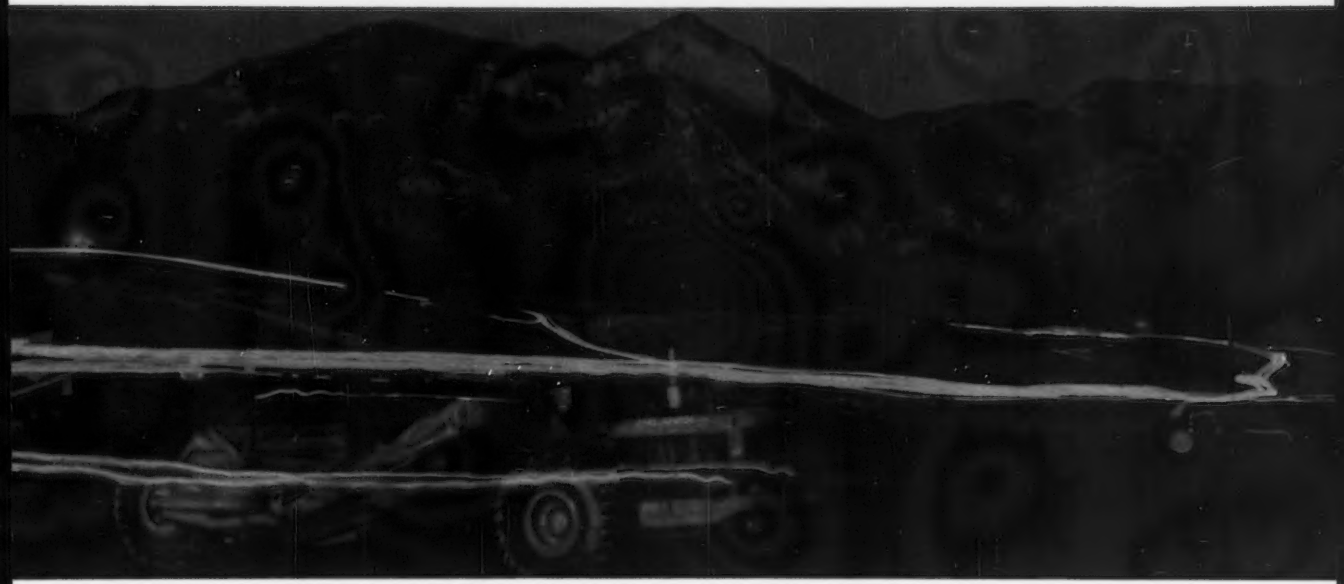
The Yieldable Arch can only be highlighted here, of course; there is much more you will want to know. Its ease of installation, for example, and its high degree of recoverability. You'll be interested too, in knowing, that many Yieldable Arch installations have paid for themselves in months! A Bethlehem engineer will gladly discuss the full story in terms of your own special problems. Just write to the address below.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

Look ahead...*move ahead*...and stay ahead with Allis-Chalmers



. . . the construction machinery that keeps your production rolling

YEARS AHEAD IN DESIGN

extra performance

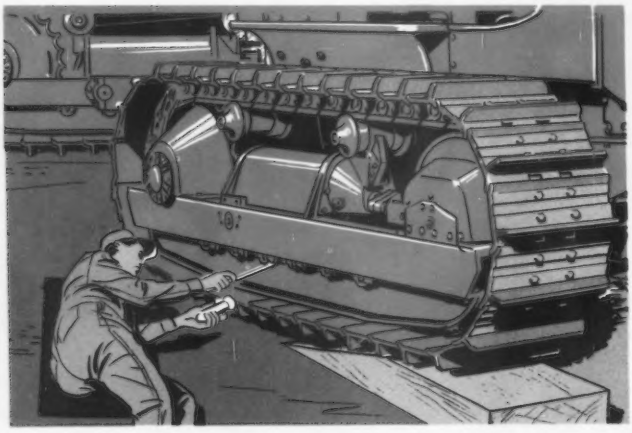
unequalled dependability

. . . backed by qualified dealer service

Your Allis-Chalmers Dealer is a Specialist in

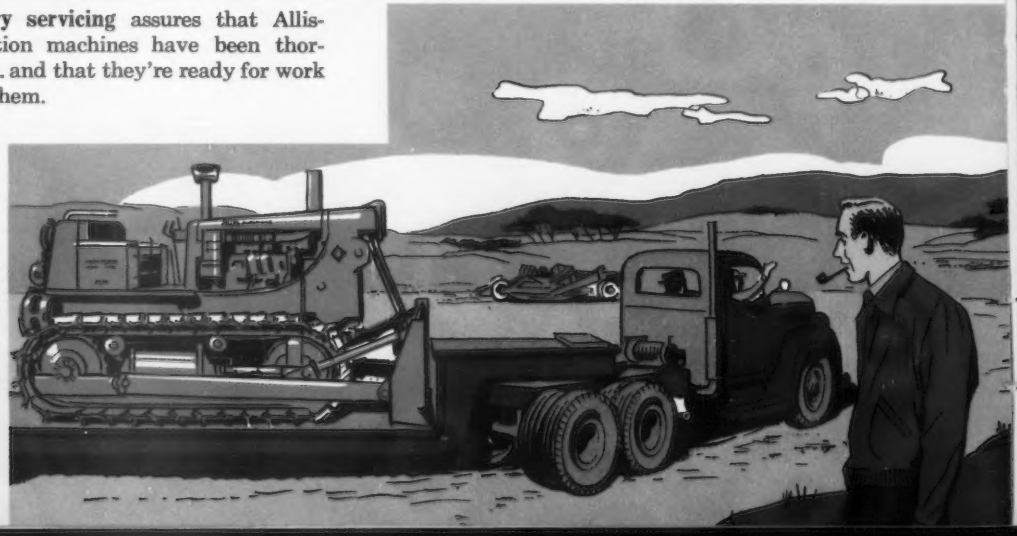
Your Allis-Chalmers dealer *knows* the equipment he sells. He can give you the expert service in shop and field that results in "like-new" performance from every Allis-Chalmers unit in your fleet . . . keeps them producing on your jobs.

Add the availability of Allis-Chalmers parts—made in the same factory, to the same rigid specifications as original equipment—and you have a program built to maintain top performance, long equipment life, low job costs for *you!*

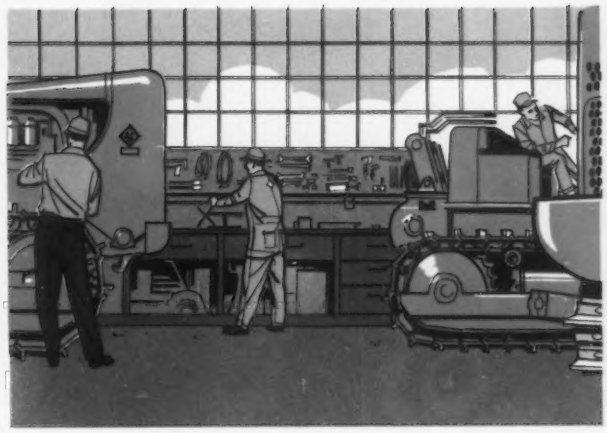


Careful pre-delivery servicing assures that Allis-Chalmers construction machines have been thoroughly rechecked . . . and that they're ready for work as soon as you get them.

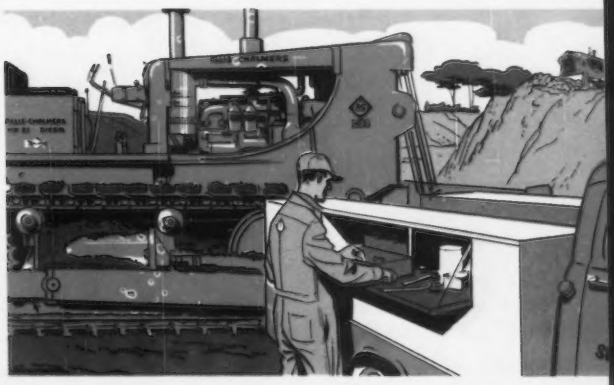
Detailed information on maintenance, adjustments and other facts on care of the machinery is delivered with the equipment. Operating tips are passed along to your men—to help them get started right and get the most from their equipment.



Service



Shop service at your Allis-Chalmers dealer is fast and efficient—because it's handled by factory-trained men, using factory-approved tools, equipment and methods. Specialized mechanics and special facilities all help to speed service.



Prompt field service—A call—any time, day or night—brings a qualified serviceman and a fully equipped "mobile workshop." Result—problems can be quickly and accurately solved . . . equipment put back on the job with minimum delay.

Scheduling checkups with your Allis-Chalmers dealer will insure that proper maintenance procedures are followed . . . stop trouble before it starts . . . keep your machines producing.

. . . and there's more to this important story . . .

your Allis-Chalmers dealer
ALWAYS READY TO ROLL...

. . . with qualified service . . . original specification parts

ENGINEERED RIGHT

Allis-Chalmers parts are designed as original equipment . . . benefit from intensive metallurgical research. And each comes from the drawing boards of experienced construction machinery engineers.

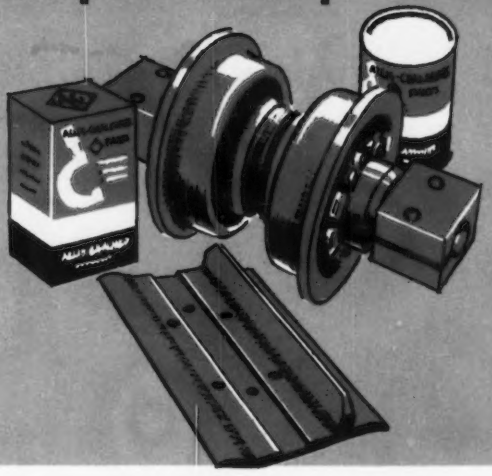
MANUFACTURED RIGHT

Precision-made parts assure long-life service. They're made by skilled craftsmen on modern industrial machinery and are subjected to original-equipment inspection and testing.

TO PERFORM RIGHT

Each part is made of top-quality material, heat-treated to correct hardness and made to exact specifications. You can depend on them for full-capacity production on the toughest jobs you have.

The men of your Allis-Chalmers dealer organization know local conditions. Look to them for equipment recommendations to fit your job requirements . . . for true value in used machinery.



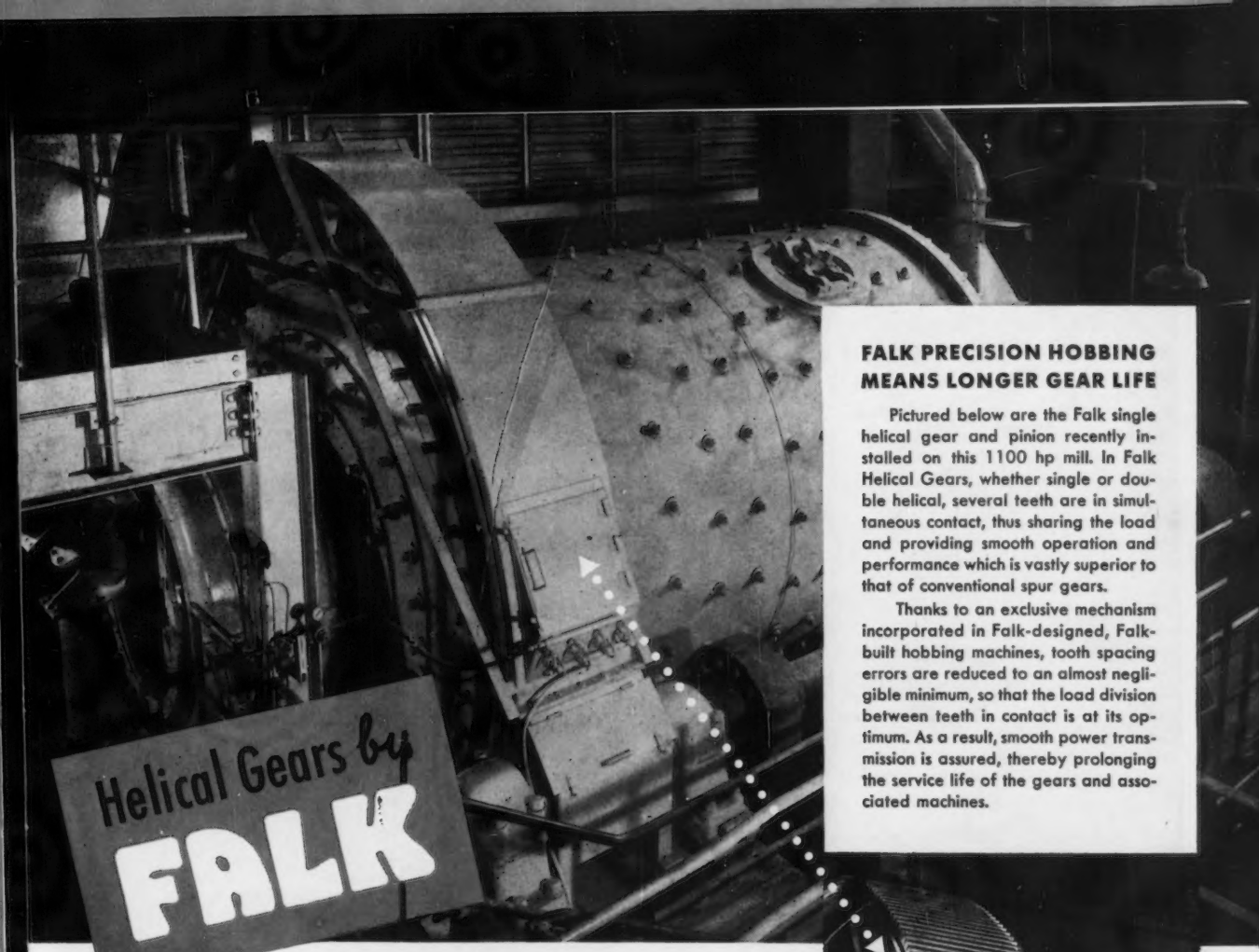
Look ahead...*move ahead*...and stay ahead

ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION, MILWAUKEE 1, WISCONSIN

ALLIS-CHALMERS

FORM MS-1305

LITHO. IN U.S.A.



Helical Gears by FALK

FALK PRECISION HOBBING MEANS LONGER GEAR LIFE

Pictured below are the Falk single helical gear and pinion recently installed on this 1100 hp mill. In Falk Helical Gears, whether single or double helical, several teeth are in simultaneous contact, thus sharing the load and providing smooth operation and performance which is vastly superior to that of conventional spur gears.

Thanks to an exclusive mechanism incorporated in Falk-designed, Falk-built hobbing machines, tooth spacing errors are reduced to an almost negligible minimum, so that the load division between teeth in contact is at its optimum. As a result, smooth power transmission is assured, thereby prolonging the service life of the gears and associated machines.

...your Best Buy in gears!

In these times of industrial expansion and modernization, Falk Helical Gearing is more than ever the first choice of experienced, economy-minded users of gear-driven equipment.

This increasing preference is the result of proved performance. Falk Helical Gears and Pinions provide *better performance over a longer service life* because they are correctly engineered...their accurately generated teeth have extra depth and extra capacity...gear efficiency, as shown by actual test data, is 98+%...the highest you can buy!

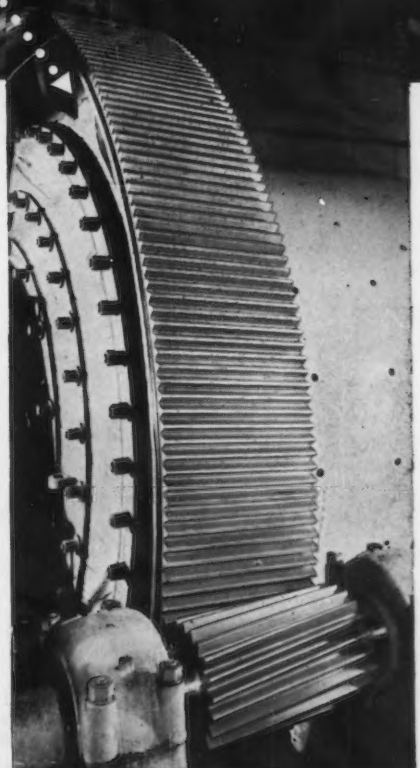
Other superior features include: high reduction ratios which permit use of higher motor speeds for greater efficiency and reduced power costs; maximum resistance against abrasive wear; smooth, helical gear action. All these factors contribute to the long service life of trouble-free operation for which Falk gears are famed the world over.

When expanding or remodeling your production facilities, it pays to remember that the performance of your equipment will not be any better than the performance of the gears that drive it. So, if uninterrupted production is important to you, specify Falk Helical Gears. They're available in sizes up to 18 ft. in diameter...in capacities up to 2000 hp.

Consult any Falk representative—also, write for
Engineering Report 6170, "Advantages of Helical Gearing."

THE FALK CORPORATION, 3001 W. CANAL ST., MILWAUKEE 1, WIS.

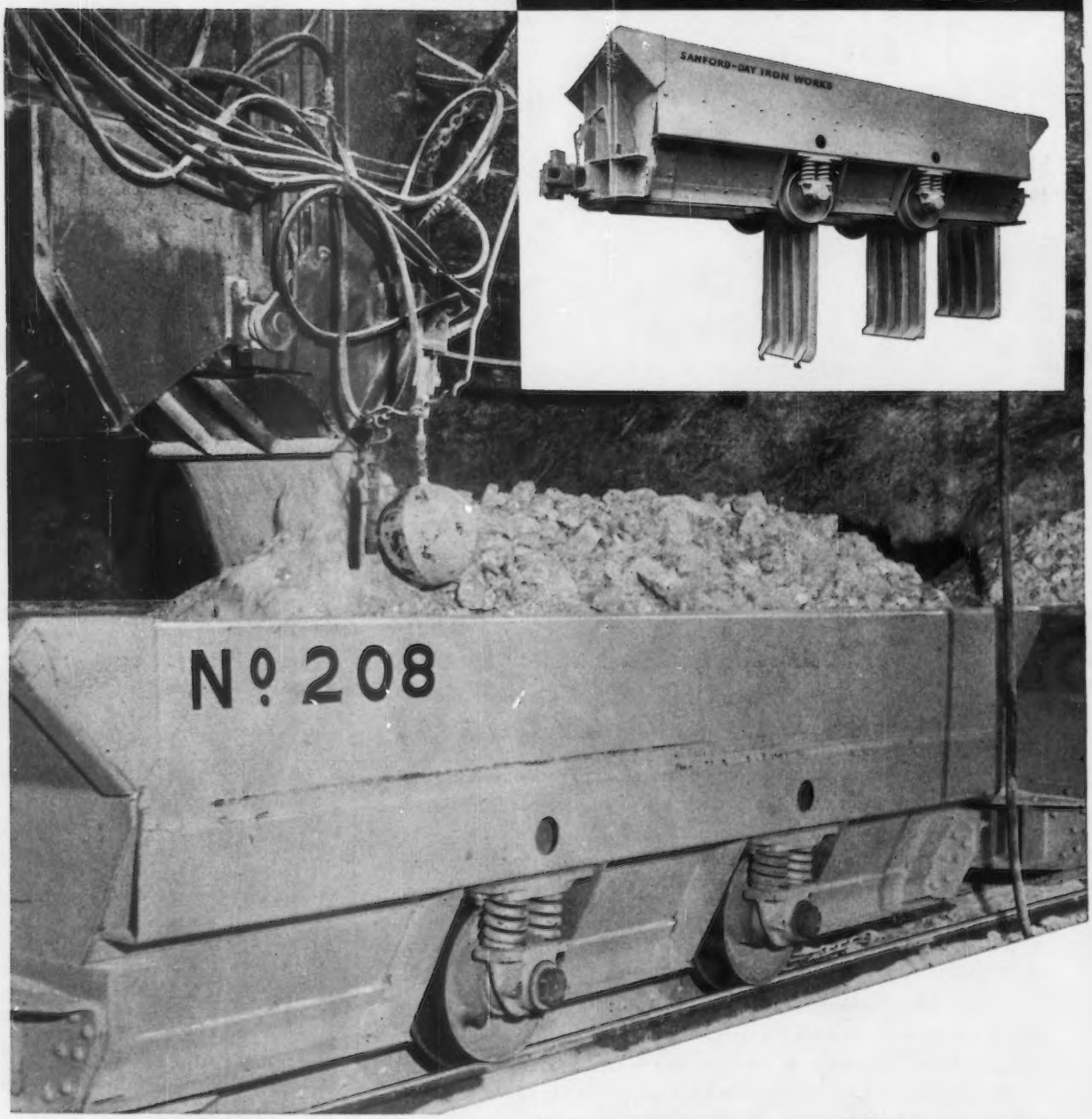
Representatives in Most Principal Cities



FALK

...a good name in industry

These S-D AUTOMATICS

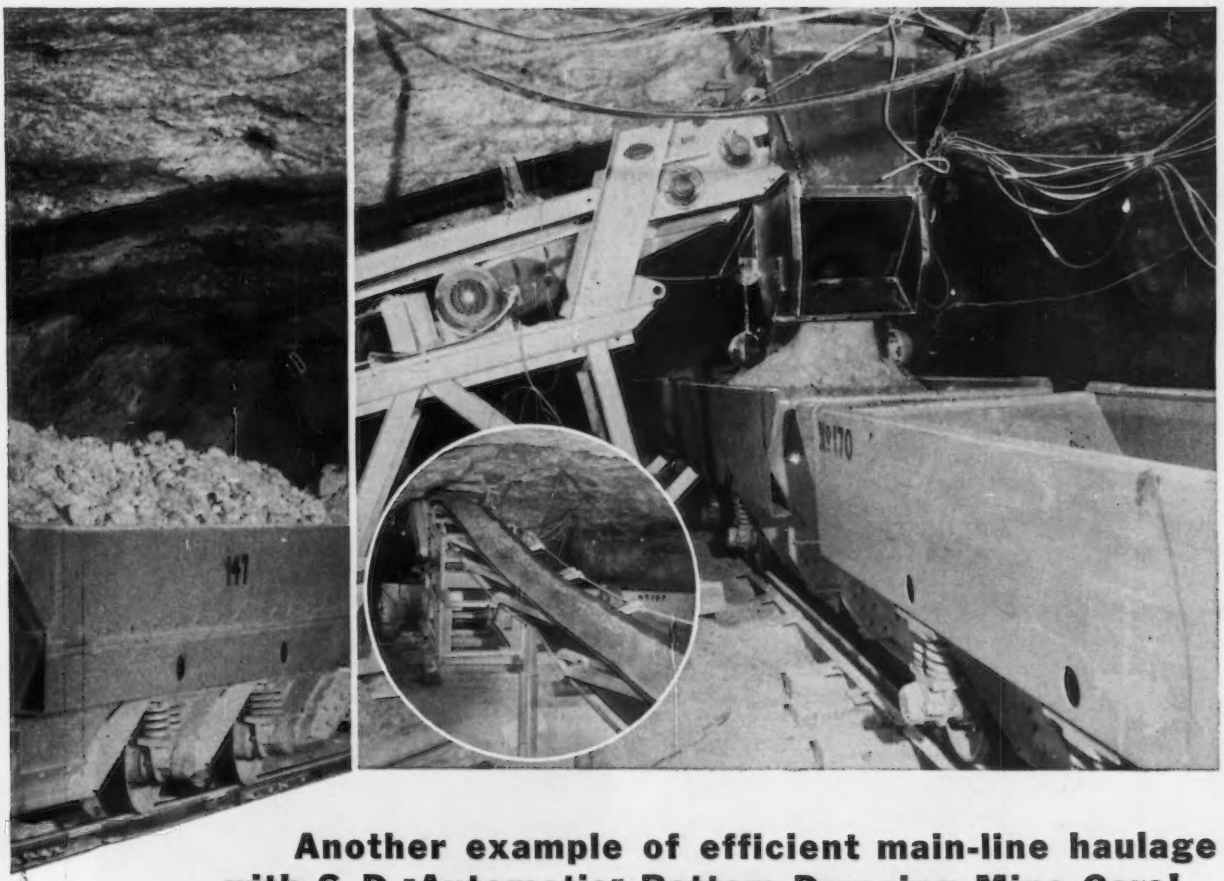


SANFORD-DAY

Knoxville, Tennessee

"SUPER MARKET FOR MINE CARS" — *all types* * PRECISION WHEELS * "BROWNIE" HOISTS, CAR RETARDERS, SPOTTERS, PUMPS AND OIL SPRAY SYSTEMS * GISMO SELF-LOADING TRANSPORT that loads *(mucks)* in development or production . . . transports . . . supports 2 to 5 jib mounted drills . . . back fills . . . moves boulder rocks . . . makes its own roadways and cleans up completely — a new method of hard rock mining offering a tremendous reduction in cost per ton!

have been in service at U. S. Potash 3 years...working 363 days per year, two shifts per day on a seven-mile run!



Another example of efficient main-line haulage with S-D "Automatic" Bottom Dumping Mine Cars!

"Because of their low center of gravity and balanced rugged construction, they hold the track exceptionally well at speeds up to 30-miles-per-hour," reports Mr. Earl H. Miller, resident manager of the Carlsbad, N. M., mining operation of United States Potash Company, Division of United States Borax & Chemical Corporation.

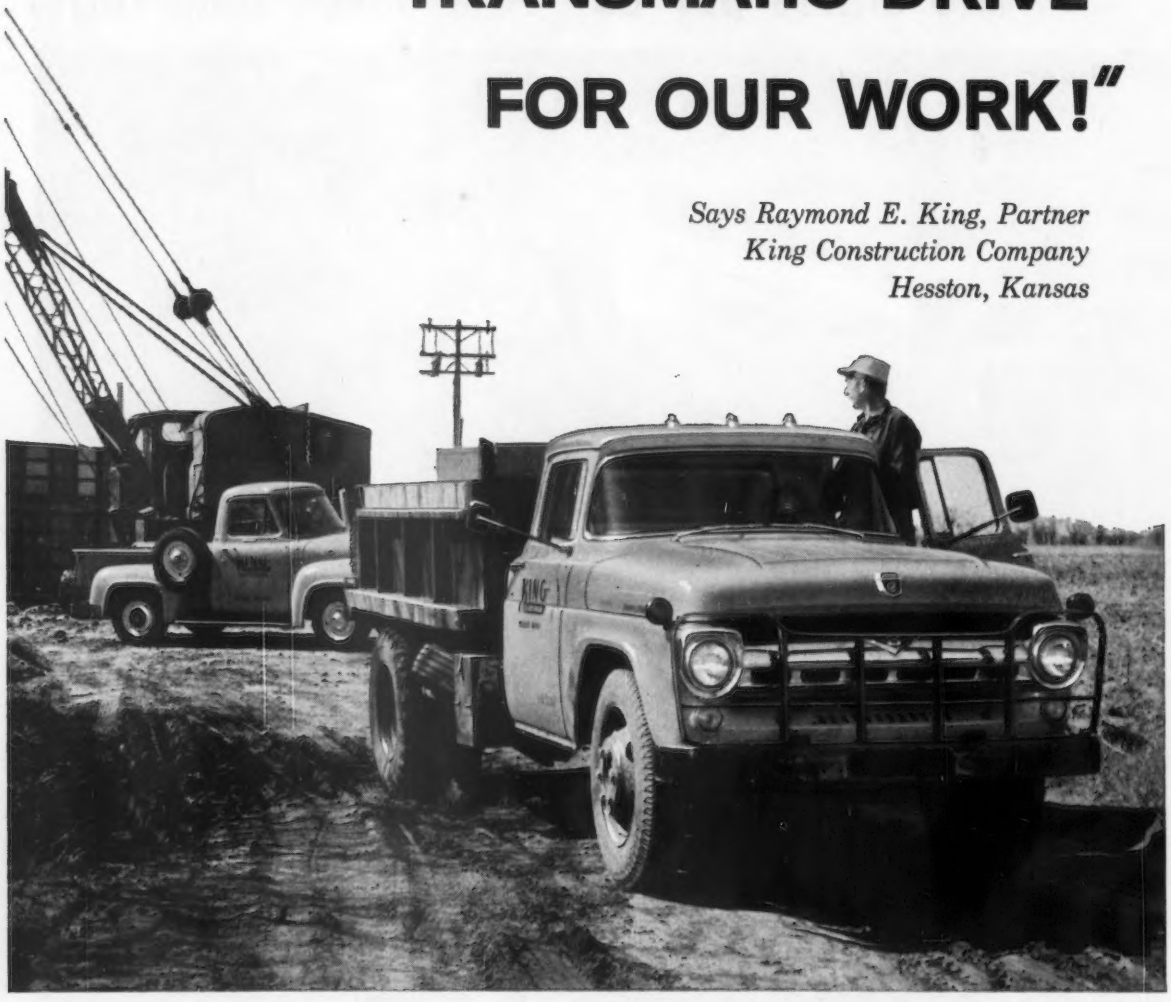
"Also," Mr. Miller continues, "the door operation is very good, allowing the cars to do a good job of self-cleaning." How does the maintenance costs of these cars compare with conventional type ore cars? "We have had very low maintenance costs on the S-D 'Automatics' compared to others we are using."

Note in pictures above and on page at left that mining management at U. S. Potash have further mechanized their main-line haulage with an automatic loading station. We are understandably proud that S-D "Automatics" were chosen for this U. S. Potash operation that incorporates the latest developments in modern simplicity and efficiency. In addition to this installation, S-D "Automatics," like the car illustrated at right, are hauling hard rock in several western mines at tremendous savings! Write us today for complete information. *Sanford-Day Iron Works, Inc., Knoxville, Tennessee*

1/4 to 1/2 TON MORE CAPACITY
Twin Latches FOR SAFE AND SURE LATCHING
SANFORD-DAY IRON WORKS
Safety Sealed AGAINST DUST LEAKAGE

"YOU CAN'T BEAT FORD'S TRANSMATIC DRIVE FOR OUR WORK!"

Says Raymond E. King, Partner
King Construction Company
Hesston, Kansas



"For off-the-road work and hauling out of sand and gravel pits our Ford two-tonner with fully automatic transmission sure handles the loads

"We've put 42,000 miles on our F-600 dump in the last 9 months and are very satisfied with it. Gas mileage is good and tire wear is reduced. Another big advantage of Transmatic Drive is that you don't tear up axles coming out of sand pits. Also, its torque converter multiplies engine torque to get loads started and prevents harmful engine lugging. To do our job with a truck not equipped with Transmatic Drive would mean buying a truck at least one size larger."

Official 1957 registrations show . . .

AMERICAN BUSINESS BUYS MORE FORD TRUCKS THAN ANY OTHER MAKE!

Bring extra savings to your business . . . make your next truck a FORD!

Official registrations for 1957 show that *American business buys more Ford trucks than any other make.* There are many reasons for this popularity . . . many reasons for *you* to make your next truck a Ford!

To begin with, Ford offers a complete line of over 360 truck models, ranging from pick-ups to giant tandems. And there are Ford Dealers almost everywhere, ready to help you select the truck best suited for your individual job. They're ready with modern service facilities, trained mechanics and low-priced Ford parts to keep your trucks on the job, earning for you.

Ford trucks are your best buy! Ford's initial costs are *low* and resale value is traditionally high. The modern Ford Style-side pickups are the lowest-priced models available with full cab-wide body . . . giving you 23% more loadspace than any traditional pickup box.

Value-packed Ford Tilt Cab trucks offer exceptional payloads, maneuverability, service accessibility and driving ease. They're America's most popular tilt-cab line *by over two to one!*

Only Ford offers the economy of Short Stroke power in all engines, Six or V-8. And Ford's Heavy Duty V-8's offer new, advanced durability features. The modern Ford Six, available in Light and Medium Duty F- and P-Series trucks, is equipped with an economy carburetor that gives you up to 10% greater gas mileage. It's plenty peppy, too, with more horsepower per cubic inch than any other six in its class.

Ford's rugged cab and chassis construction means these new '58s are built to last. Every Ford has safety glass in every window. All this plus proof that Ford trucks last longer adds up to America's No. 1 truck value.

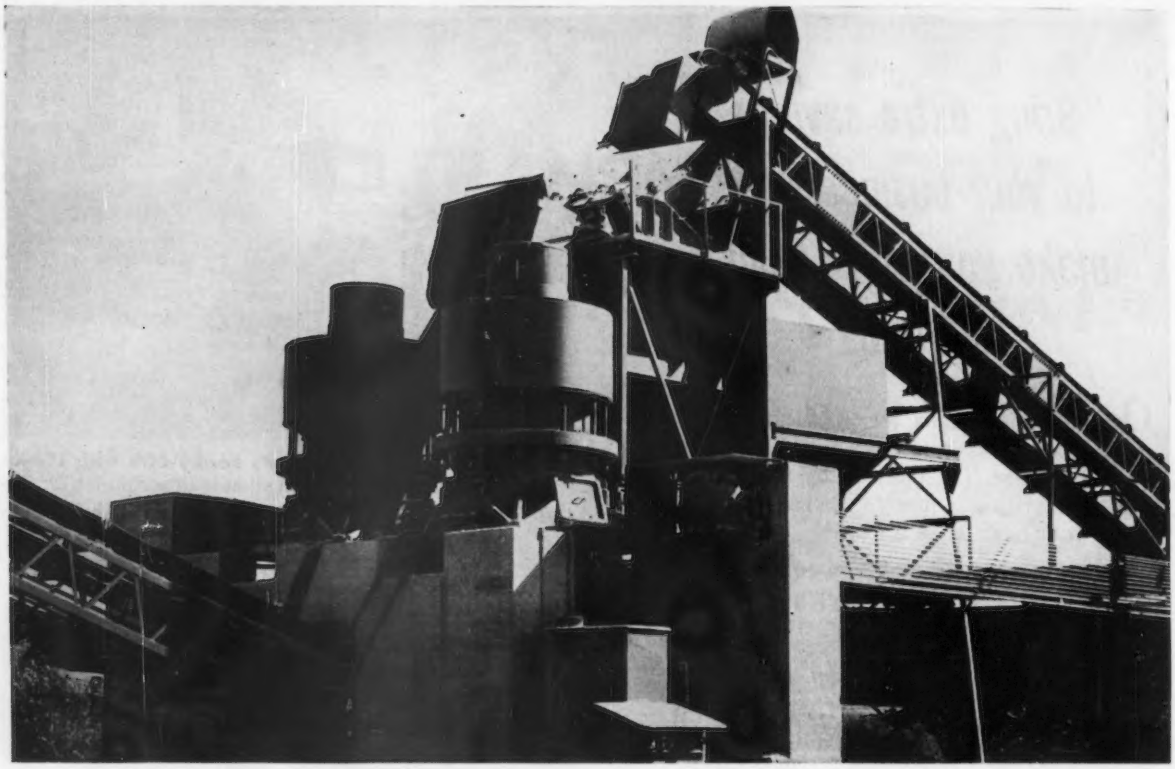
See your local Ford Dealer for the latest in '58 trucks or the best in A-1 used trucks.

King Construction Company's Ford F-600 with 178-hp Heavy Duty V-8 engine is an all-around performer. Transmatic Drive enables driver to easily back truck into position.

Carrying 5 to 6 yards of sand or rock, this Ford dump truck hauls many loads daily from nearby production sites.

FORD TRUCKS COST LESS

LESS TO OWN . . . LESS TO RUN . . . LAST LONGER, TOO!



KENNEDY GYRATORY CRUSHERS

KENNEDY Gyratory Crushers, made for both Primary and Secondary duty, are noted for low maintenance, long service and dependable operation. No other gyratory has the power-saving, built-in synchronous motor drive.

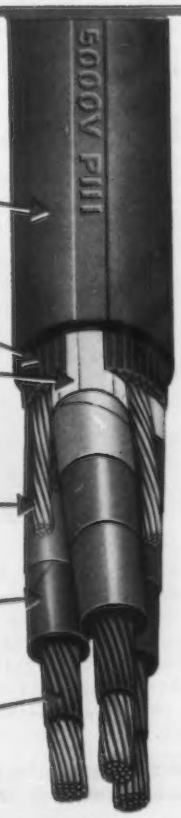
Duty—For handling practically every material used in the aggregate, cement, lime, mining and chemical industries; used where capacities are high and uniformity of product size is required.

Sizes—Primary: feed openings from 3″ x 8″ to 72″ x 243″; Secondary: 8 different sizes to meet wide range of requirements.

Design—Self-aligning ball and socket eccentric and forced lubrication minimizes wear.

KENNEDY VAN SAUN
MANUFACTURING & ENGINEERING CORPORATION
405 PARK AVENUE, NEW YORK 22, N. Y. • FACTORY: DANVILLE, PA.

YOU CAN SEE WHAT MAKES ROEBLING MINE POWER FEEDER CABLE YOUR BEST BUY!



Tough, long-wear Roeprene® sheath wards off moisture, retards flame, resists oil, corrosion, abrasion. Meets flame-resistance requirements of Pennsylvania Dept. of Mines and carries symbol P-111.

All-rubber fillers for moisture resistance, splicing ease.

Tin-copper shield tape for added safety of operation.

Adequate ground wires, in contact with conductor shielding. Grounds equal more than 90% of circular mil area of single power conductor, for complete grounding and fault return.

Butyl insulation for heat-, moisture-, ozone-resistance. Rated at 90° C copper temperature through 5000 v; 85° C through 15000 v.

Semi-conducting tape around each conductor prevents excessive voltage stress and ionization between conductor and insulation.

These are features that add up to longer, better, more economical service. Even at peak loading, rugged Roebling Mine Power Feeder Cable gives peak performance!

Pride of workmanship, special design features and finest raw materials make the difference. But don't take our word for it. See for yourself. Let us show you samples and give you recommendations and details as they apply to your application. Write to Electrical Wire Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

ROEBLING

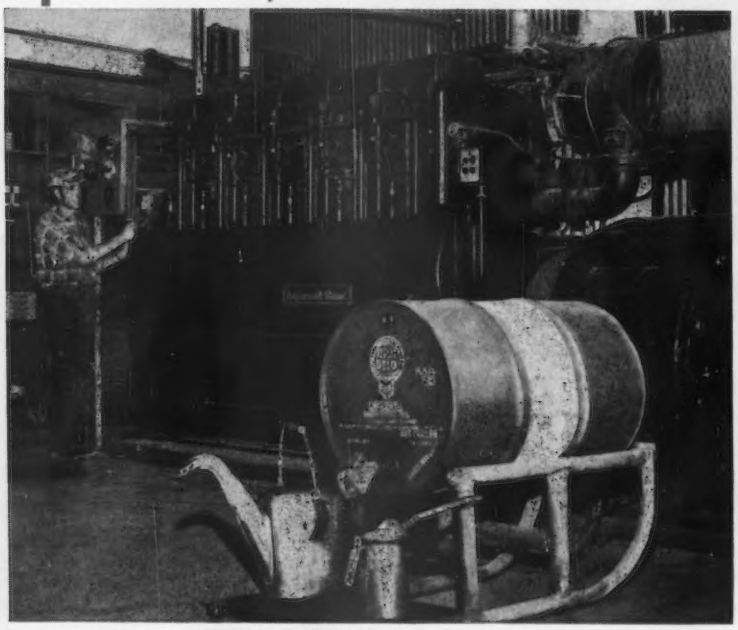
Branch Offices in Principal Cities
Subsidiary of The Colorado Fuel and Iron Corporation

ENGINEER'S FIELD REPORT

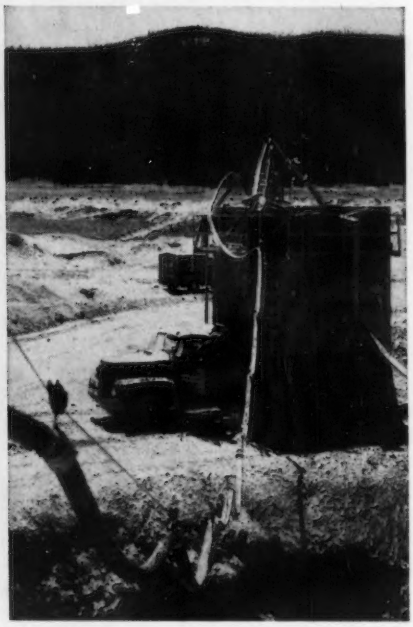
PRODUCT **RPM DELO OIL**

FIRM **PORTER BROTHERS CORP.**
Bear Valley, Idaho

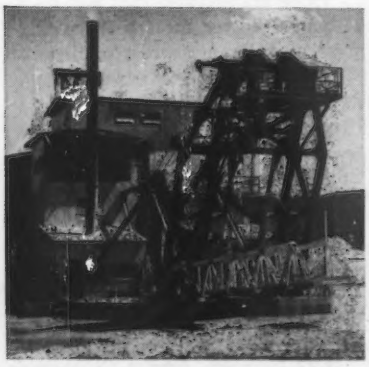
Operates 7,000 hours without measurable wear

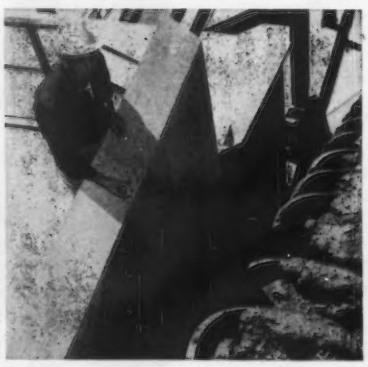


Lubricated with RPM DELO Oil, this 650-hp Ingersoll-Rand diesel is still in nearly new condition after three years' service. "We found no carbon sludge or lacquer when we tore it down last winter," says Power Plant Foreman Bill Niece (above). "And there was no measurable wear on rings, liners or bearings, though it had run more than 7,000 hours!" Engine is in power plant of Porter Brothers Corp. Firm dredges for strategic minerals under government contract.



Trucks hauling firm's ore work 'round the clock, 9½ months a year. Despite the tough punishment of carrying heavy loads over unpaved mountain roads, RPM DELO Oil keeps engines running smoothly, and eliminates excessive wear.





Giant dredge (left) processes nearly 6,000 yards of gravel every 24 hours. "Both this and our smaller dredge depend upon our diesel-generators for power," explains Superintendent Clay La Fon (right). "That's why we do everything possible to keep them running properly...and that includes using RPM DELO Oil. We've had excellent results with it in all our equipment...in our power plant, in our trucks, and in the tractors that level our tailings and restore the areas we've worked."

Why RPM DELO Oils reduce wear—prolong engine life

- Oil stays on engine parts—hot or cold, running or idle
- Anti-oxidant resists lacquer formation
- Detergent keeps parts clean
- Special compounds prevent corrosion of bearing metals
- Inhibitor resists crankcase foaming

For More Information about this or other petroleum products or the name of your nearest distributor, write or call any of the companies listed below.

LUBRICATING OILS RPM DELO

TRADEMARK "RPM DELO" AND CHEVRON DESIGN REG. U.S. PAT. OFF.

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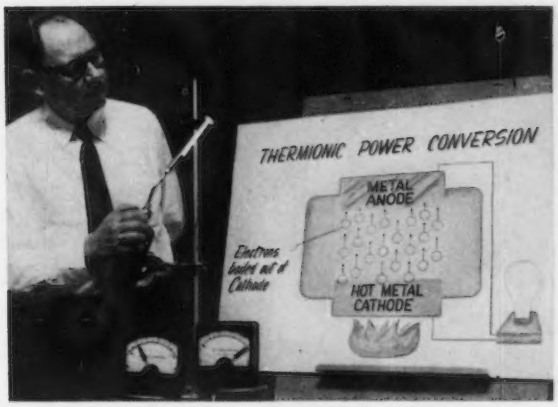
E&MJ NEW PRODUCT DIGEST

In this issue–the Thermionic Converter–General Electric's experimental device that produces electricity by boiling electrons off metal electrodes, some new mining tools, equipment for the mill and smelter, and a visit to the Mechanical Handling Exhibition held at London, England. In addition, 50 select new literature items have been noted on the hard card opposite p 44.



Thermionic Converter Produces Electricity By Boiling Electrons From Hot Metal Surface

General Electric Co. announced a new development—a working model of the Thermionic Converter which in contrast to the original converter announced last year, uses a high vacuum rather than a gas atmosphere. New device is a combination of metal and ceramic disks surrounded by a high vacuum. It is the size of a quarter and produces electricity when the flame of a blowtorch is played upon it.

Possible application of the converter could be found wherever a high temperature source is available and electricity is needed. Any source of heat, conventional or nuclear, will do.

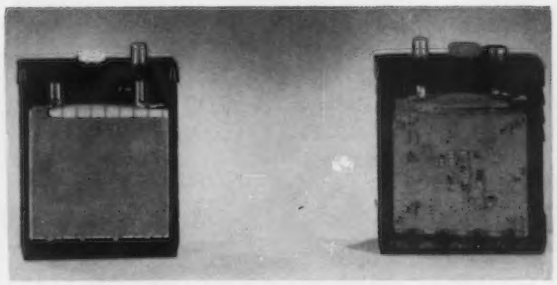
In the converter, two electrodes are held at high but different temperatures. Electrons boil off one electrode and condense on the other and flow through the external circuit as electricity. Present converted efficiency is very low, about 8% for the original cesium gas-filled model, but General Electric scientists say that a 30% efficiency is practicable.

Make Sure of Ground Before Welding

During arc welding, a heavy electric current passes from the arc welding generator through cables to the metal being welded. It then jumps across the gap, melts the electrodes and returns to the generator. According to the service dept. of Caterpillar Tractor Co., the arc could and does often jump across any gap in the equipment being welded. The current may also break up and flow through numerous paths on the work. Caterpillar says that transmission bearing, engine bearing and gear failures have been traced to stray arc welds (forming weld blothes on the part). Caterpillar says fasten a ground clamp directly to the piece being welded—give the current a short, direct, uninterrupted, clean path and stray current damage won't occur.

Laboratory to Study Pollution Control (1)

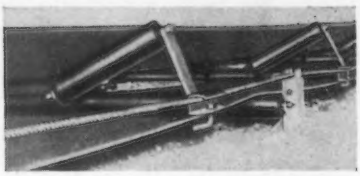
Roy F. Weston, Inc., has a booklet that describes the laboratory and pilot plant established for the study of industrial water and air pollution problems. Pilot plant is portable and can be taken to the client's plant for actual test runs.



Auto-Lite Battery Has 50 Months Warranty (2)

Studies have shown that only about 40% of auto battery failure in severe service is due to electrochemical reasons. The rest is caused by mechanical failure of the plates due to excess vibrations. Auto-Lite has developed an auto battery that under test withstood 1000 hours on a shaking table. Truck battery will be available soon, says the company. Power plates are anchored with resin to the plate grooves in the bottom of the case. New design is at the left in photo above.

For more information on new products and for copies of the literature circle the proper number on the New Products reply card, give your name and adress, and mail card to E&MJ



Long Introduces Three New Products for Underground Haulage (4)

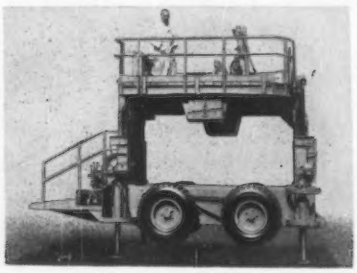
A dual-purpose loader (left) has been added to Long Co.'s line of Pigloaders. This is Model 188-D, and has a specially-designed swing boom to work with bridge conveyors and shuttle cars.

Second new piece is the Lo-Rope conveyor (center) with ropes, support stands, and idler connections to the rope completely out of the way of the carrying run of the belt.

Inspector's Friend is the name of the new multi-purpose utility car shown at the right. Three wheeled, rubber-tired and battery operated, the car will haul 500 lb plus the operator.

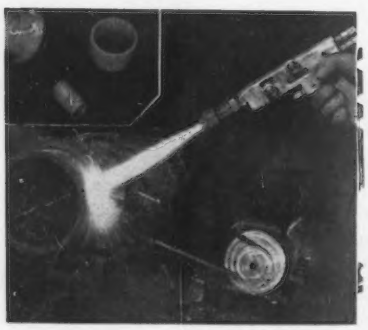
Continuous Miner (5)

Lee-Norse Co. announces two new miners—CM37 (37 in. high) and CM47 (47 in. high). Model CM37 cuts a maximum of 7 ft 3 in. high, while CM47 cuts to 9 ft.



Jumbo For High Seams (6)

HSHL-4B Acme Machinery Co. Hi-Lift stoper jumbo is designed for high veins or seams with a minimum thickness of 9 to 10 ft. Platform supports two stopers which are positioned manually on a travelling and traversing bar. Platform tilts 15 degrees, front to back.

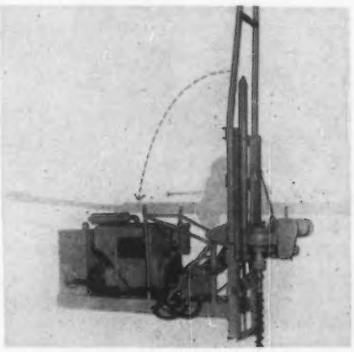


Tungsten Carbide Powder (7)

Kenspray, a hard surfacing tungsten carbide containing powder that can be applied by conventional metal spraying is now available from Kennametal Inc.

For Soft Backs (8)

Connors Steel Div., H. K. Porter Co., Inc., has tested the new RX-5 roof bolt designed for difficult roof control problems in soft strata. Tests show that resistance to initial displacement has been increased by 30% over earlier bolt designs. Improvement is due to new expansion unit. For 1⅜ in. holes.



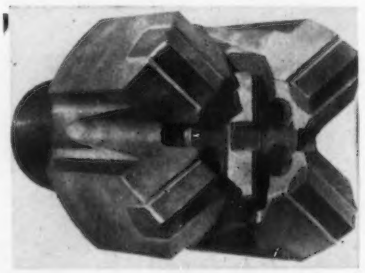
Mobile Drill (9)

Designed for augering, coring and large diameter boring, Mobile Drilling, Inc.'s Explorer will handle continuous flight augering to 75 ft. It will core to 500 ft, or bore 24-in. diameter holes. Maximum height with tower down is 55 in.

Down-the-Hole Drill (10)

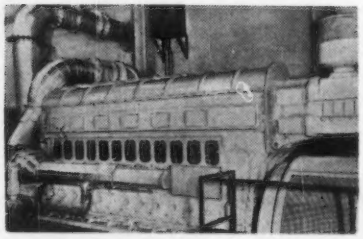
Hammerdril, is now available from Mission Mfg. Co. after eight years of development. Two models are available —high (250 psi) and low pressure (100 psi). Depending on air pressure and model, the machine can be adjusted to operate at from 500 to 6000 strokes per minute. Can be used on any standard rotary rig. Drill stem sizes for both models are 3⅞ and 5¼ in. O.D.

Holes made by the Hammerbit shown above in the next column are cleaned by air. Tool can be pulled off bottom of the holes to permit additional air blast. Hammerdril will function under water. Drill requires a pull down weight of 2,000 to 2,500 lb.



Bit With Central Chisel (11)

To go with the new Hammerdril (No. 10), Mission Mfg. Co. has developed an X-bit with a central chisel to eliminate pulverization that occurs with full cross or X-bit designs. Bit can be resharpened in the field. Bit sizes for the 3⅞-in. tool are 4½ and 4¾ in. For 5¼-in. tool, bit sizes are 6, 6½, and 6⅝.



Diesel Engines

Turbo-supercharged opposed-piston diesel engines with up to 3600hp are now available from Fairbanks, Morse & Co. Company says supercharging adds 50% to the engine's capacity and offers a 5 to 10% fuel saving. Units are 6 or 12 cylinder design. **(24)**

Allis-Chalmers Mfg. Co. has introduced two diesel power units for on-the-job use—Model D-334 (88hp) and Model D-516 (131hp). Smaller model is four cylinder, larger is six. **(25)**

Euclid Div., General Motors Corp., says that Cummins 220hp engines are now available in Euclid's R-18 dump truck. **(26)**

Both the standard and heavy models of the Pneumatractor and the Pneumatractor Rotadrill of Schramm, Inc. are now equipped with diesel engines using the gasoline starter principle. **(27)**

Ion Exchange Resin (30)

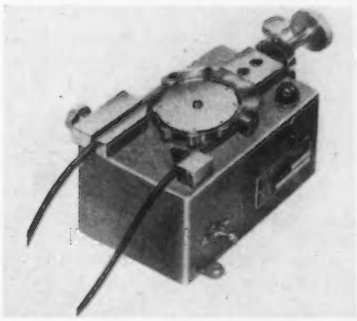
Strongly basic ion exchange resin called Amberlite IRA-402 has been developed by Rohm & Haas Co. Highly porous. High volumetric capacity. Recommended for organic compounds.

Improved Separan (31)

All Dow Chemical Co. production of Separan 2610 has been converted to a refined Separan NP10 which has superior product uniformity, increased solution clarity and higher purity than the older products.

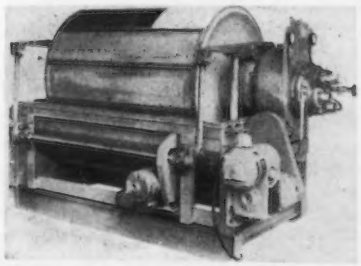
Pine Oil Replacement (32)

Hodag PX-1, developed by Hodag Chemical Corp., is a combination of alcohols, hydrocarbons and surface active agents which can be used as a replacement for pine oil.



Metering Pumps (33)

Continuous metering pumps that can transfer liquids and gases through plastic or rubber tubing at exceptionally slow feed rates has been announced by New Brunswick Scientific Co. Model PA-1 can meter as little as two millimeters per day; Model PA-93 75 ml/min.



Fiberglas Filter (34)

Dorr-Oliver Inc. has developed a filter (rotary vacuum) made of Fiberglas, costing less than rubber-covered or stainless steel. Unit has been tested in U.S. uranium mills on acid circuits. Drum is Fiberglas; tank is molded plastic supported on a steel frame.

Improved Spiral Thickener (35)

Denver Equipment Co. has an 8-page bulletin illustrating the modern features of their improved spiral rake thickener. Enclosed mechanism runs in oil, has large bearing surface, and maximum torque design.

Tank Level Controller (36)

Accuray tank level detector-controller designed by Industrial Nucleonics Corp. is attached outside the tank, free from fouling by process material and can be set to fail safe for high or low signal. Radiation source used.

Electric Nibbler (37)

Portable Nibbler cuts woven wire, screen cloth and gasket material up to 3/16 in. thick. Will also cut sheet metal. Two models available from Modern Mfg. Co., Inc.

Rubber Belt Cleats (38)

Rema Cleat, developed by Flexible Steel Lacing Co., is a specially designed rubber cleat that can be applied to rubber conveyor belts in the field without heat through the Rema self-vulcanizing process. Cleats help haul material up steeper inclines at higher rates.

Rubber Gear Pump (39)

Low volume, positive displacement pumps for acids, alkalies and other corrosives have been developed by American Hard Rubber Co. with all rubber casing and gears, Kel-F bearings and rubber-covered shaft. With ½ hp, 875 rpm motor, pump delivers about 12 gpm maximum. Maximum head is 120 ft.

Electrostatic Separator (40)

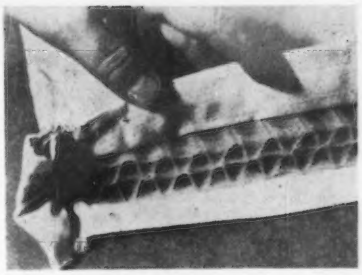
Kipp Kelly Ltd. has available two models of their Electrofloat electrostatic separator. Capacities as high as 5,000 lb/hour have been obtained commercially. Kipp Kelly has testing facilities in London and Winnipeg. Company also makes an air table for dry concentration work.

Sand Classifier Cone (41)

Meckum Engineering, Inc. has literature available on what the Meckum-Floatex sand classifier cone is and can do. Unit can classify at almost any mesh, and has been rated at 40-tph capacity. Multiple units available. Pump is only moving part.

First aid cabinets small enough to mount close to hazardous areas, yet large enough to provide all necessary first aid items are available from General Scientific Equipment Co. Units are 66 in. high, 24-12 in. **(48)**

Aluminized asbestos hot suits manufactured by Safety Clothing & Equipment Co. can withstand 2000 deg F. **(49)**



Filter Cloth Support (42)

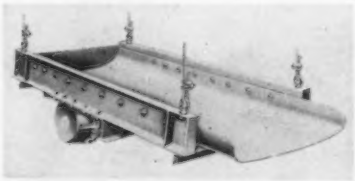
National Filter Media Corp. says that Trilok, a woven Saran and polyethylene fiber, is a very desirable filter cloth support and drainage member material. It can be used on disk, panel, pressure, Moore leaf types, pans, filters and even envelope type dust collectors.

Cation Exchanger Resin (43)

Dow Chemical Co. is marketing a white cation exchanger resin called Dowex 50W which is said to have greater physical stability, less internal stress, decreased heavy metal content and greater bead strength than previous resins.

Jaw Crusher (44)

Latest addition to Eagle Crusher Co. line of jaw crushers is a 30x42 in. feed opening model rated at 125 to 400 tph. Jaws adjust between ⅛ and 8 in.



Feeders and Conveyors

Vibrating feeder—Link-Belt Co.'s MC (motorized counterweight) feeder is capable of feeding hot, abrasive, fine or lumps, heavy or sticky materials at a uniform rate. Twelve sizes with capacities up to 250 tph are available. **(45)**

Belt feeder—Barber-Greene Co.'s Model F-8 belt feeder has a capacity range of from 5 to 550 tph. Unit is pre-engineered, packaged, ready for installation. Two drive arrangements available. **(46)**

Vibrating feeders—Eriez Mfg. Co. has begun production of a heavy-duty electro-permanent magnetic vibrating feeder rated at 4 tph. **(47)**

Corrosion Test Lab (23)

Laboratory capable of testing the corrosion rates on nearly all metals and alloys has been established by the Carpenter Steel Co., Reading, Pa. Lab will do customer test work.

E&MJ Visits the Mechanical Handling Exhibition (London)

MECHANICAL HANDLING EXHIBITION was held in London, May 7 to 17 at Earle Court where a wide variety of U.K. manufacturers displayed their products and literature. Through McGraw-Hill Publishing Co.'s World News Bureau, *E&MJ* toured the show. Here are some of the interesting new products and literature gleaned from the show. No attempt has been made to list all the companies or all the products displayed.

Earthmovers

Combination front-end and overdump, wheeled loader, the Merton Two-Way Loader Model FC 60 and F 60 have front-end drive and hydraulic shovel. Standard bucket is 1 cubic yd. Other attachments are available. According to Merton Engineering Co. Ltd., the Two-Way design permits material discharge from either end. **(113)**

High-discharge Merton overloaders are available in two designs—EHD (fixed 17 ft elevation) and HD (variable elevation from 10 to 14 ft). Unit is crawler-mounted, has 4-cylinder Fordson diesel, and ¾ cubic yd bucket, Merton Engineering Co. Ltd. **(114)**

Stanhay (Ashford) Ltd. says that the Shovelall can pick up 12 cubic ft of material from the ground level up to 6 ft, and can discharge it at any height to 14 ft. Diesel engine. Larger buckets available. **(115)**

Hydraulic grab with 1 cubic yd clamshell (1 ton)—the R. H. Neal & Co. Ltd. Pelican Loader—uses a Fordson diesel having maximum road speed of 12 mph. **(116)**

Small (1 ton) mobile crane Type GM, featuring self-raising telescopic extension masts with available heights of 15 to 25 ft and 25 to 40 ft, was featured by the R. H. Neal & Co. Ltd. booth. A wide variety of mobile cranes is also available from the company. **(117)**

Small Dumpers

Road Machine (Drayton) Ltd. has two models of the small diesel dumpers available—the Roadmac 1 and 2. **(118)**

One-yard Mark III Bates Brothers (S.M.W.) Ltd. diesel dumper has three speeds forward (10 mph maximum) and one reverse, and a self-tipping and reseating skip. **(119)**

Autolifts & Engineering Co. Ltd. Model 300 (3 cubic yd) dumper is powered by a Fordson diesel and features two-way, hydraulic driver position. **(120)**

Muir-Hill Model 10B (3 cubic yd) dumper was displayed by E. Boydell & Co. Ltd., as was the Model 14B (4.5 cubic yd). Available in two body constructions. **(121)**

Transporters, Skips, Hoists

Monoveyor—a monorail transporter, ground—has a prime mover consisting of a 20hp opposed twin cyclinder water-cooled diesel or an 18hp air-cooled diesel. Prime mover drives three hydraulic pumps which motorize six hydraulic motors (one to each driving wheel). Unit comes equipped with two trailers and will transport, dump and return automatically according to Road Machines (Drayton) Ltd. **(125)**

Drag scrapers and scraper systems in in the Beaumont design are available through International Combustion Ltd. in capacities ranging from 65 to 450 tph (based on 200 fpm inhaul and 400 fpm outhaul). **(126)**

Skiphoists in unbalanced single, balanced single and balanced double skip designs, are available from New Conveyor Co., Ltd., in hand-operated, semi- and fully-automatic construction. **(127)**

Tipple hoists, car turners (rotary and side discharge), ore bridges and unloaders were featured by Strachan & Henshaw Ltd. at the exhibition. **(127)**

Loaders and Shovels

Brayloader 430 (1½ cubic yd), Model BL 440 (1⅛ cubic yd) and Model HL20 (1¼ cubic yd) are hydraulically powered tractor shovels. Bray of Feltham, England. **(122)**

Michigan tractor shovels—Models 75A and 175A—were exhibited by Michigan (Great Britain) Ltd. These are all-wheel drive units with 1¼ and 2¾ cubic yd buckets, respectively. **(123)**

Model 2-WL Muir-Hill loaders are provided for tipping discharge above 6 ft 9 in., and are available with buckets of many designs in sizes from ¾ to 3 cubic yd capacity, according to E. Boydell & Co. Ltd. **(124)**

Conveying Systems

Screw conveyors and bucket elevators are available from Ajax Equipment Lt. **(136)**

Screw conveyors and screw-lift elevators —W. S. Barron & Son, Ltd. **(137)**

Corruband belt conveyor has 3-in. corrugated flanges at the edges that permit the belt to handle rounded gravel up 27 deg inclines at 200 fpm (190 tph) according to C. H. Johnson (Machinery) Ltd. **(138)**

Redler System of handling bulk materials in any direction, using a drag conveyor inside a dust-tight housing, and the Redler power shovel, piler and spreader are illustrated in literature available from Redler Conveyors Ltd. **(139)**

Blanket conveyors for conveying material up 40 to 45 deg inclines, drag chains, hoists, elevators and screens are part of the W. J. Jenkins & Co. Ltd. line. **(140)**

Serpentix conveyor—molded crossribs of rubber bolted together—cableways, conveyors, cranes, derricks, loaders ropeways, docks, tipples and marshalling yards cover the line of equipment available from Mitchell Engineering Ltd. **(141)**

For Your Files

This selected manufacturers' literature is free unless otherwise specified. If item is for sale, send request and money direct to manufacturer.

Exploration and Mining

SOIL SAMPLING KIT available from Acker Drill Co., Inc. is illustrated in 4-page bulletin. **(51)**

PORTABLE ROTARY DRILLING equipment is illustrated in Davey Compressor Co. bulletin. 6pp. **(52)**

CARBIDE MINING TOOLS in the Carmet Div., Allegheny Ludlum Steel Corp. line are presented in 17-page catalog. **(53)**

Electrical Equipment

BUTYL RUBBER—National Electric Products Wire & Cable Division's Nepcozone Insulation—is thoroughly explained in text, tables, drawings and charts. 27pp. **(54)**

CABLE COUPLERS for portable high-voltage cable, PLM Products, Inc.'s Type AC, can be examined through a 4-page catalog-bulletin (375). **(55)**

REVOLVING FIELD ac generators (one or three phase) in the 20 to 100kw and 50-60 cycle range are illustrated in Kato Engineering Co. Group 2 bulletin. **(56)**

REPAIRING your dc mill motors to provide years of added life—a General Electric Service Shop report (GEA-6775) illustrates how GE rebuilds your motors. 4pp. **(57)**

DC EXCAVATOR DRIVE—what it is and how it operates—is the title of General Electric Co. bulletin (GEA-6714) illustrating the motor used on most Bucyrus-Erie shovels and draglines. Well illustrated. 12pp. **(58)**

AC ELECTRIC GENERATING PLANTS (gasoline, gas or diesel) in the Jetapower Power Equipment Div., Jeta Metal Fabricators, Inc. line are illustrated in a 4-page bulletin. **(59)**

ALL-PURPOSE diesel electric plants from D. W. Onan & Sons, Inc. can be examined through a 2-page data sheet on the new Series DSL unit. **(60)**

FOUR-CYCLE, V-angle gas engine power generators in three sizes are available from Ingersoll-Rand according to three recent fliers. Series PJVG (220 to 295hp), PSVG (408 to 816hp) and PKVG (880 to 1760-hp). **(61)**

TRACTOR SHOVEL, the Allis-Chalmers HD-6G with 72 engine horsepower and 1½ cubic yd bucket capacity is illustrated in 6-page bulletin. **(62)**

TRENCHING, loading and dozing machines, complete units mounted on a Case 34 or 42hp utility tractor, are illustrated in literature available from J. I. Case Co. **(63)**

SPECIFICATION BULLETINS on four Trogan tractors (1-, 1½-, 2- and 4-cubic yd) are available from Yale & Towne Mfg. Co. **(64)**

GAS TURBINES manufactured by Clark Bros. Co., Dresser Industries are detailed in two bulletins. 28pp and 6pp. Models Mark TA, 302 & 305. **(65)**

THERE IS a difference in diesels is the name of a 12-page brochure released by Detroit Diesel Engine Div., General Motors Corp. Data includes diesel vs gasoline, 2-cycle vs 4-cycle, fuel systems and fuels. **(66)**

LOAD LUGGER SYSTEM of material handling using the detachable skip (2 to 16 ton capacity), is illustrated in Ingersoll Kalamazoo Div., Borg-Warner Corp. bulletin. A larger (30-ton capacity) unit is being introduced. Skip can be set on the ground and released, then, when loaded, picked up again, transported and dumped. Spare skips permit the shovel to load one while the truck hauls the other. **(67)**

TRUCK CARRIER for 35-ton capacity cranes are manufactured by Maxi Corp. according to literature available. **(68)**

Motors

ENCLOSED PANCAKE MOTORS bulletin from Louis Allis Co. describes the motor that reduces motor length by up to 60% over standard units. 4pp. **(69)**

AIR-TO-AIR heat exchanger cooling is one of the features of Allis-Chalmers Type TEFC motors. Both standard and explosion proof designs are available. 8pp. **(70)**

Maintenance Aids

MANGA-TONE, nickel manganese build-up rods, are discussed in Resisto-Loy Co., Inc. flier. 2pp. **(71)**

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Please send me the catalogs or further information about the items from New Products Digest whose numbers are circled. **JULY 1958**

1	17	33	49	65	81	97
2	18	34	50	66	82	98
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E&MJ NEW PRODUCTS DIGEST (*Continued*)

METAL STITCHING—a technique whereby two pieces of material may be joined together by wire fed from a coil, cut to length, formed, driven through both materials and clinched, all by machine—is detailed in Acme Steel Co.'s 15-page bulletin. **(72)**

DIFFERENT, NOT DIFFICULT is the title of Reynolds Metals Co. booklet on welding, soldering and brazing aluminum. Illustrated. Detailed. 7pp. **(73)**

CHECK CHART for maintenance painting, developed by Wilbur & Williams Co., tells you what to do, how to do it and with what W&W product. For metals, interiors, floors and exterior walls. 6pp. **(74)**

Wire and Rope

SERVICE LIFE OF WIRE ROPE can be extended according to Leschen Wire Rope Div., H. K. Porter Co., Inc. bulletin No. 106. Bulletin lists causes and corrections for localized wear and damage. 4pp. **(75)**

REGISTERED SLING CHAINS from American Chain Div., American Chain & Cable Co., Inc. are presented in Acco bulletin (DH-105). 24pp. **(76)**

Metal & Mineral Processing

AMERICAN CYANAMID CO.'S annual reprinting of "Flotation" from *Industrial & Engineering Chemistry* is now available. **(77)**

HANDY SLIDE RULE available from Smith Engineering Works gives one the chance to accurately determine the proper size Telsmith crushers, their gap setting and product screen analysis. **(78)**

OVERDRAIN CLASSIFIER—Hardinge Co.'s new drag-belt unit—is described in a 4-page bulletin (AH-478). **(79)**

WEIGH FEEDERS and dry feeder machines are detailed in two Syntron Co. bulletins. **(80)**

PNEUMATIC WEIGH CELLS improve automatic weighing and blending—a 4-page reprint from *Automation*, is available from Builders-Providence, Inc. **(81)**

TY-ROCK SCREENS catalog 68 is available from W. S. Tyler Co. 20pp. **(82)**

CONTINUOUS MIXERS manufactured by Baker Perkins Inc. are described in a 7-page bulletin. **(83)**

CONVEYOR BELT CARRIER bulletin (355) from Stephens-Adamson Mfg. Co. features comprehensive technical data and illustrations on the S-S 745 and 755 ball bearing carriers, and others. **(84)**

BELT CONVEYOR REPAIR material catalog from Automatic Vulcanizers Corp. tells how to do the job in 20 pages. **(85)**

LIMBEROPE CONVEYORS — the latest design of the Joy system—is described in a two-page bulletin from Joy Mfg. Co. **(86)**

HIGH-VELOCITY ELECTRONIC DUST COLLECTOR—the Electro-Cell—is now being offered by American Air Filter Co., Inc. Unit operates at face velocities of up to 600 fpm. Efficiencies of up to 97% are possible, according to bulletin No. 258. **(87)**

BUELL ENGINEERING CO., INC. has an 8-page bulletin that details a recently installed mechanical and electrostatic dust collecting unit that has 48 cyclones and 2 large twin-section precipitators. **(88)**

AIR-TO-AIR heat exchanger, the Therm-O-Wheel designed by Therm-O-Wheel Inc., is illustrated in literature available. Unit is designed to maintain comfortable temperatures in office, plant, or shop in conjunction with your present heating or cooling system. **(89)**

NIAGARA BLOWER CO. sectional vapor condensers are discussed in a 4-page bulletin (139R). **(90)**

MAGNETIC IDEAS FROM ERIEZ is a 48-page booklet of operating ideas on the many applications of permanent, non-electric magnetism. Eriez Mfg. Co. **(91)**

Valves and Controls

SOLENOID VALVE factory stock list No. 505—a selection guide and price list—has been prepared by Automatic Switch Co. 8pp. **(92)**

FACTORS TO CONSIDER in the selection and application of automatic transfer switches is a 23-page bulletin prepared on the subject by Automatic Switch Co. **(93)**

SLIDING-GATE, self-operating temperature control valves are introduced in OPW-Jordan bulletin J-180. 4pp. **(94)**

BAILEY RECEIVER RECORDER and plug-in components are illustrated in Bailey Meter Co. bulletin E12-5. **(95)**

AUTOMATIC CHEMICAL ANALYSIS is possible with Technicon Instruments Corp.'s Auto Analyzer system in both the laboratory and plant, according to a 15-page bulletin. **(96)**

AUTOMATIC BIN LEVEL indicators for all bulk solids are discussed in Bin-Dicator Co.'s 19-page, well illustrated bulletin. **(97)**

HAYS CORP. has developed a universal electronics recorder that will print four records on one circular chart. According to literature, two different electronic receivers are available. **(98)**

In secondary blasting, it's a lot better to hook-up and ignite your safety fuse with *Quarrycord*

Prime with safety fuse and blasting caps. You'll play-it-safe two ways:

- No danger from stray electrical currents or thunderstorms.
- No big "boom!": you get a series of small shots: "pop-pop-pop".

Connect and ignite your safety fuse primers with Quarrycord and play-it-safe *again* because—

- No men on the rock pile. The entire blast is set off by *one* man at a point where escape is safe and easy.

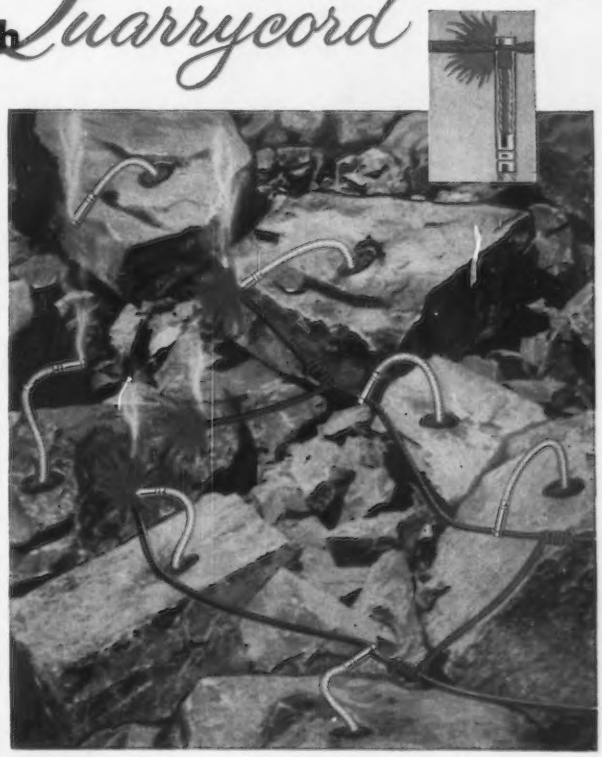
Quarrycord is packed on spools in 100-ft. lengths. It is easily lighted with a match and burns with a very hot open flame at the rate of about one foot per second.

HOW TO USE QUARRYCORD

Cut your safety fuse in equal lengths as prescribed by your State law, and prepare your primer cartridges. On the end of the fuse opposite the blasting cap place a Connector. This is a metal tube containing an ignition compound in the slotted end, and color-banded for easy identification. Load and tamp the holes.

When ready to blast, connect all holes with Quarrycord, placing it in the slot of each Connector and pressing the "lid" down to hold the Quarrycord firmly in place and assist ignition.

Connect your main lines with cross lines wherever these will cut down the over-all burning time. Lead main lines off to a point away from the rock pile. When all is ready, light this end with a match and go to a place of safety. Q-S



It's quite a story, told completely in this folder which we'll send you, free, when you ask for it. Write today.

Your explosives supplier can supply Quarrycord and Connectors.

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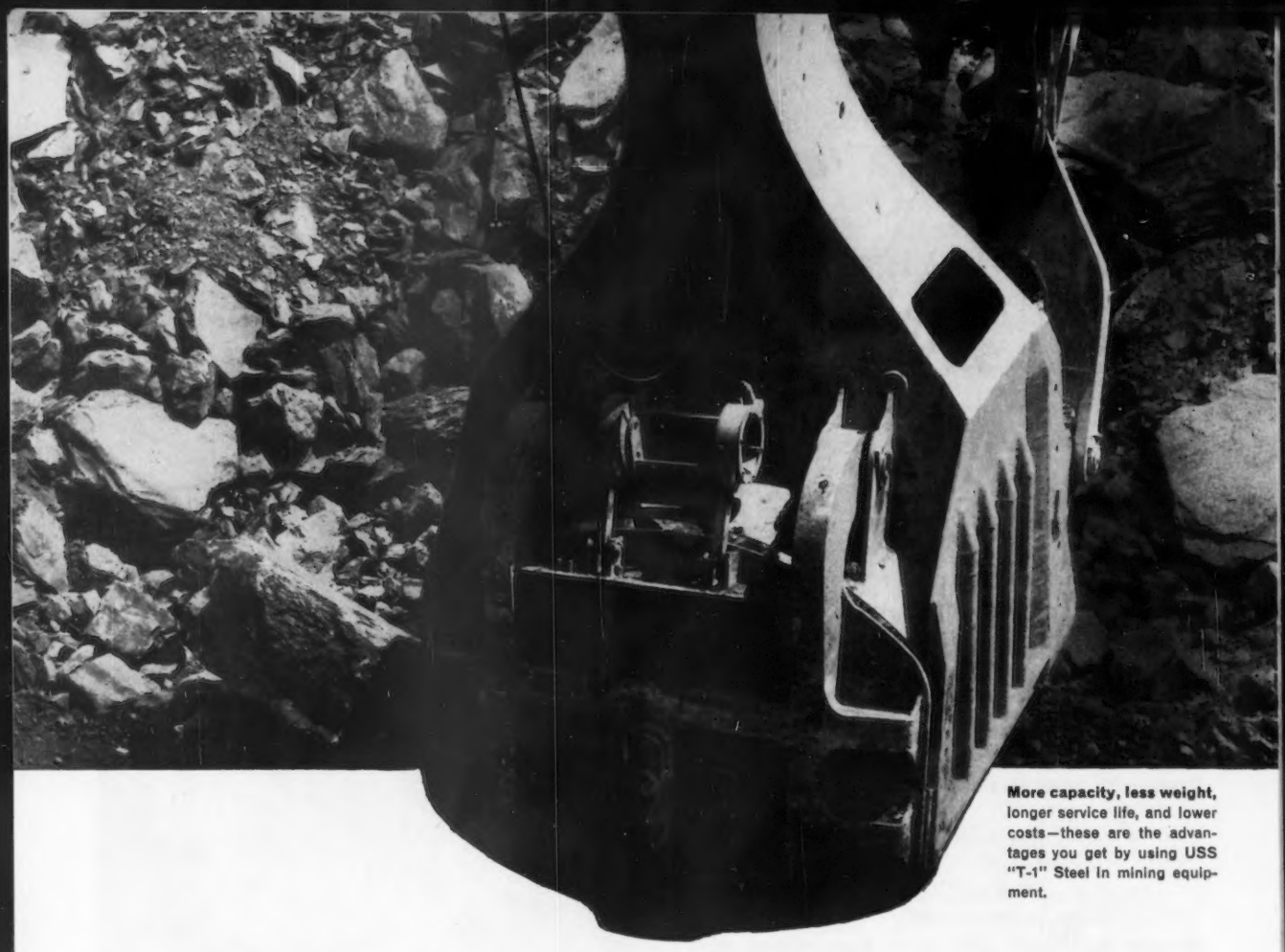

More capacity, less weight, longer service life, and lower costs—these are the advantages you get by using USS "T-1" Steel in mining equipment.

Dippers that ram through rock

built stronger, tougher and lighter with USS "T-1" Steel

Did you ever cling to the "crow's nest" of one of the new giant shovels and feel it ram into a wall of rock and shale? The big machine shudders, then braces its feet and digs in with all its tremendous mechanical muscle. The dipper becomes a real battering ram—and you wonder how any steel can stand such punishment, day after day.

United States Steel engineers and metallurgists asked the same question, and developed a special steel, USS "T-1" brand. This steel can take terrific shock and impact abrasion. It's extremely tough—even at 50° below zero. And it is now available with more than three times the yield strength of structural carbon steel—100,000 psi minimum.

This great strength permitted a weight saving of 40 tons in one large shovel where "T-1" Steel was used in the dipper, dipper stick, bail and crowd rack. In spite of the high strength, shovel manufacturers had no difficulty welding, forming and machining this quenched and tempered alloy steel.

USS "T-1" Steel can help you. Consider it where you need a steel with great strength, extraordinary toughness, or resistance to impact abrasion combined with ease of fabrication. Write for our book *USS "T-1" Steel.* United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

Immediate Delivery. USS "T-1" Steel products are now immediately available in minimum mill quantities. Reason: our new continuous heat-treating line is now in full operation. It assures better delivery as well as top quality.

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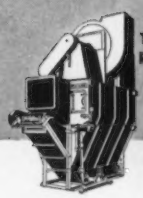
USS **United States Steel**

How AAF Licked the URANIUM Dust Problem



Twelve uranium mills now rely on AAF Dust Control equipment

When pioneer operators found that dust from uranium processing assayed as much as *seven times* richer than the ore itself, they knew they couldn't afford to "experiment" with dust collectors. Logically, they turned to AAF.

AAF has been salvaging uranium dust since 1940. Now a dozen uranium mines are using AAF collectors to reclaim this dust and keep operations clean. The AMERjet fabric dust arrester is a favorite for this service, especially where dust must be collected *dry*. AAF's wet-collecting Type N ROTO-CLONE does the job in another way . . . produces a slurry of uranium-rich material. *Both do the job well*—better than 99% efficiency!

Take a tip from uranium—call your AAF representative or write direct for AMERjet Bulletin 279 and Type N ROTO-CLONE Bulletin 277.

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AAF Dust Control Equipment

AAF Filters and Precipitators

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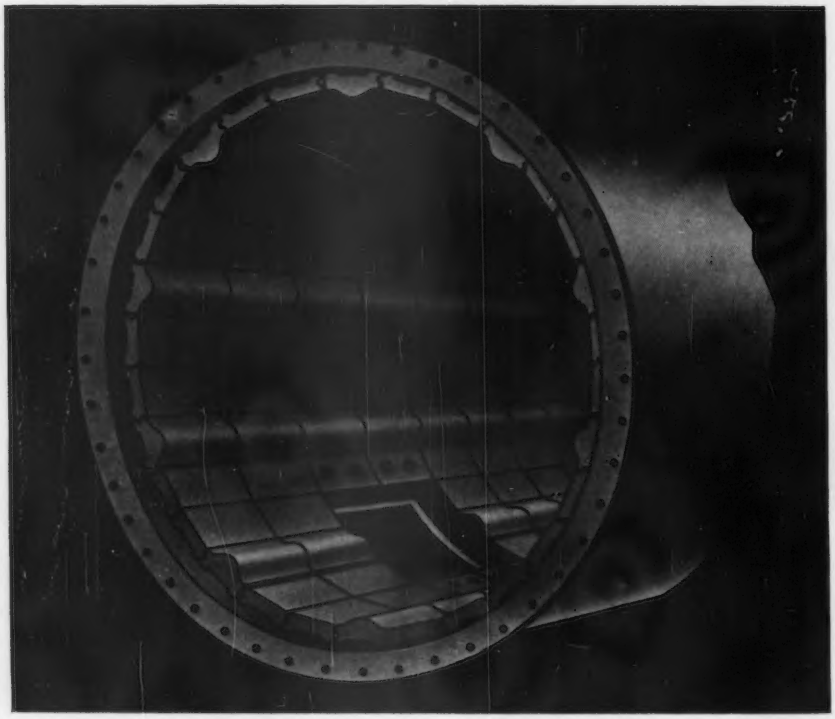
Cycoil Oil Bath Air Filters

Herman Nelson Unit Heaters



"You Can Reduce Grinding Costs and Improve Mill Performance with Long-Lasting B&W Universal Liner Plates

B&W Universal Liner Plates can reduce your cost per ton of material ground. They're easy to handle, store and install, wear longer and more evenly, and require less replacement."

Here's why:

1. **Lower Initial Costs.** Standardization eliminates chiller and pattern costs.
2. **Reduced Costs In Liner Inventory.** Standardization is possible because one design fits all diameters of mills. Standardization means quicker unloading and storage.
3. **Longer Life For Liners.** Better quality control on a mass production casting, utilizing permanent molds, results in uniform wear. Ideal size for uniform chill and heat-treatment.
4. **Reduced Costs In Determining Most Efficient Wear Patterns.** You can get wear profiles consisting of all lifter ribs or all flats from the same castings, as well as a combination of both including straight or spiralled lifter pattern.
5. **Longer Life For Different Applications.** This is assured by selection of proper materials. Design is suitable for either chilled irons or wear steels.
6. **Reduced Costs In Both Direct Labor and Outage.** Installation time is less because small size and weight of castings allows them to be handled easily, without cranes and with less fatigue for workers. Also, liners can be installed without turning the mill.
7. **Reduced Costs In Storage Space.** Because small castings stack easily, little storage space is required. One design of casting interchangeable for all size mills also simplifies records.
8. **Reduced Costs On Breakage Claims and Delays For Replacements.** Small castings are rugged and almost impossible to break by handling. Large castings of hard, brittle irons sometimes break in shipment.

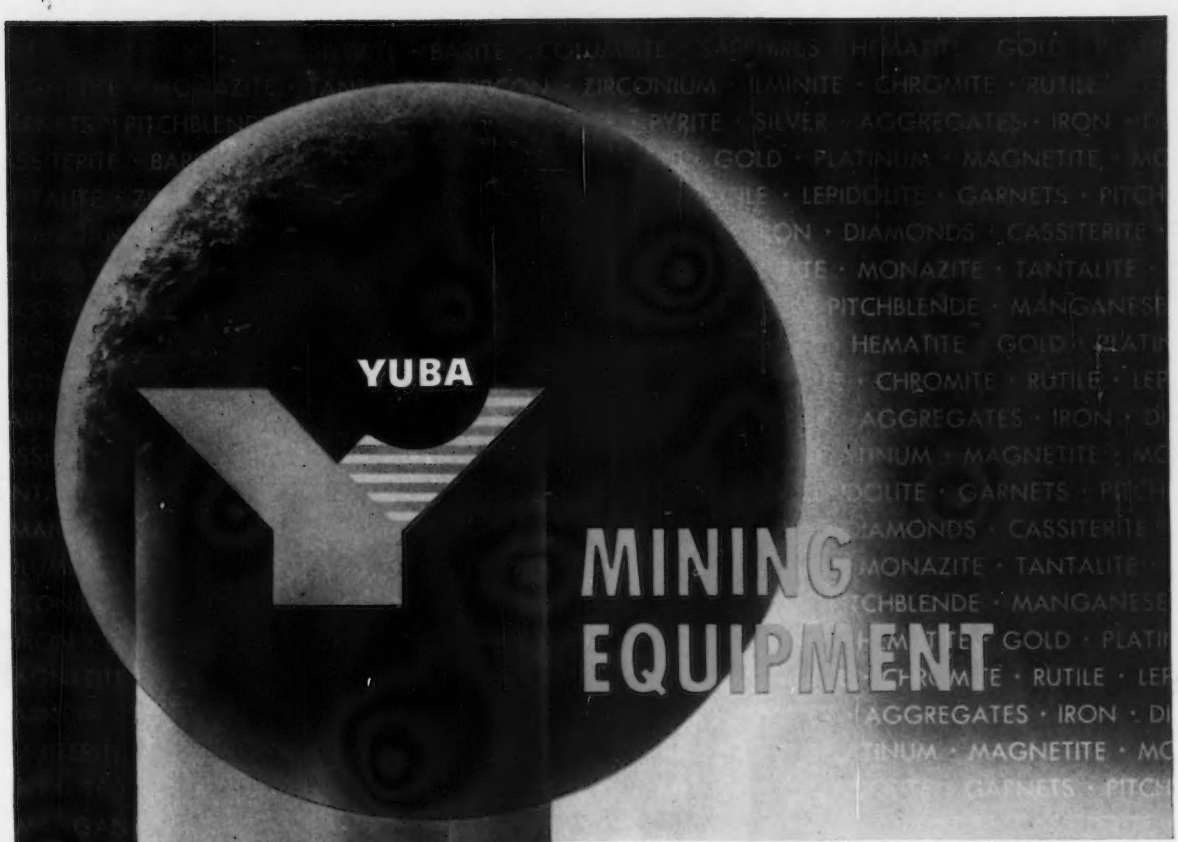
Liners are supplied in two nominal thicknesses, 1½" and 3" with 1½" high lifters. Castings are 6" wide x 12" long. Positive seating of small castings on mill shell means less breakage of castings under operating conditions.

For additional information on B&W Universal Tube Mill Liner Plates, write The Babcock & Wilcox Company, Process Equipment Department, Barberton, Ohio.

S-478

BABCOCK & WILCOX

BOILER DIVISION



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YUBA has carried on major mining operations for half a century. So Yuba puts practical *working* knowledge into the *design and building* of mining *equipment.*

Years-ahead side diaphragm jigs with trouble-free adjustable drives – non-clogging screen plates of abrasion resistant steels developed especially for Yuba – exclusive seals protecting underwater dredge bearings – these are typical of the many features which have made Yuba equipment known, used and respected around the world.

Whether you're separating diamonds, iron or cassiterite – or moving millions of yards from deep river beds – you'll find it profitable to phone, wire or write Yuba.

YUBA MINING DIVISION

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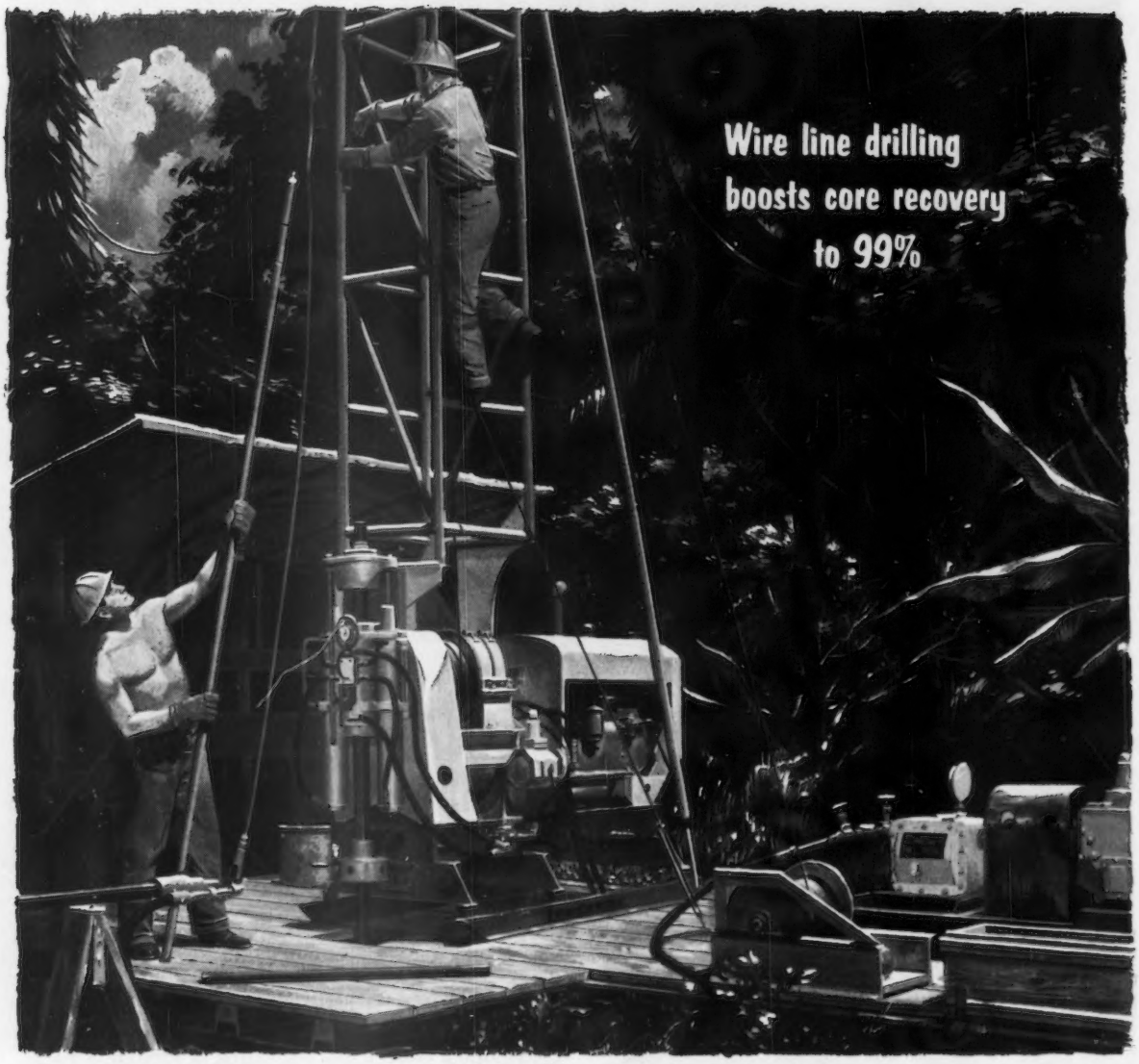
YUBA CONSOLIDATED INDUSTRIES, INC.



31′ Per Shift through Broken Limestone and Chert

During a recent exploration, the first 95 feet of one hole were drilled with conventional BX and NX tools. Core recovery was a low 35%. At 95 feet the driller switched to Longyear BX Wire Line. Core recovery for the remaining 1340 feet of the hole was 99%. In fact, in 733,000 feet of Wire Line Drilling in 21 states, core recovery has averaged 94.5%.

In ground that blocks frequently, drillers using conventional equipment are reluctant to pull hundreds or thousands of feet of rods for every 2 or 3 feet of core. Instead, they often drill through the blocks.

In contrast, drillers using Longyear Wire Line can recover the blocked core easily, and will do as often as necessary. Thus, with Wire Line, drillers obtain maximum core recovery while the drill rods remain in the hole acting as casing. In fact, drilling often progresses for hundreds of feet before it is necessary to pull rods to replace the bit.

To learn how Longyear Wire Line Drilling, functioning as part of Longyear *Coordinated Systems*, can save you time and money, write for *Longyear World #4* today, E. J. Longyear Company, Minneapolis 2, Minnesota.

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PAYHAULER FLEET

whips 17% grade with bonus loads

The Caldwell Engineers' five-unit 65 Payhauler® fleet highballs 2,500 cu yd of shot rock 1,000 feet daily up a haul road with 17% average grade. That's how this subcontractor keeps on schedule! His contract calls for excavating and crushing 165,000 tons of rock on the $13,000,000 hydro and flood control Oliver Dam under construction at Columbus, Ga.

Making the 17% grade with bonus loads is routine for the Payhauler fleet on this newest of all dams being built by the Georgia Power Co. at Columbus.

"These are crooked haul roads," reports excavation foreman Dudley Rabb, "but our Payhauler fleet is whipping them to keep us on schedule. The rigs haul through axle-deep water 50% of the time...make pull-outs up roads that rise 170 feet in 1,000 feet...yet speed bonus loads to crusher and stockpile."

Prove the get-away surge, and up to 25% faster haul speed of an International Payhauler—the result of bonus turbo-charged diesel power; road-matched and load-matched gear choice; and the power-cushioning leverage of planetary drive axles.

See how a Payhauler shortens the cycle with pick-up truck spotting ease. Discover how exclusive high reverse, zip-around power steering, and grade-beating power boost your profits. Try split-second dumping with the double-acting hydraulic hoist. Measure the advantage of Payhauler operating ease, and downgrade safety of positive Torqmatic braking! See your International Equipment Distributor for a demonstration!

International® Construction Equipment

International Harvester Co., 180 North Michigan Ave., Chicago 1, Ill.

A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors... Self-Propelled Scrapers... Crawler and Rubber-Tired Loaders... Off-Highway Haulers... Diesel and Carbureted Engines... Motor Trucks... Farm Tractors and Equipment.

"With our TD-24 we are pushing 40-ton rock slabs —dozing and ripping at a 50% better rate than with our other big tractor," states Owner L. J. Luttjohann. He removes a 24-inch-thick hard rock stratum; rips and dozes-off a soft rock layer with his "24" to uncover high-grade limestone deposits.

How Planet Power-Steered TD-24 outproduces clutch-steered competitor by an amazing 50%

...stripping for Luttjohann Stone Co.,

States Operator Alvin Hanson "This new TD-24 Torque Converter is great for my ego. The other dozer's operator works harder, but I move at least one-half more material per day than he will!"

Dozing 40-ton chunks of stone aside—ripping worthless rock layers into movable spoil—this Planet Power-steered TD-24 is outproducing its 20-ton steering-clutch-steered competitor, by the amazing margin of 50%!

Both crawlers are working under identical conditions. Both are ripping and stripping overburden for the Luttjohann Stone Co., near Topeka, Kansas.

The decisive difference is: the TD-24 has "live" power on both tracks all the

overburden!

Topeka, Kansas

time. Planet Power steering eliminates load-limiting "dead-track drag." You don't "half-kill" your power and traction to guide the TD-24—as you must with any king-sized steering-clutch tractor. You can even "equalize" TD-24 track speed to steer accurately with big offset loads!

Both king-sized crawlers cost approximately the same to buy and operate. But the TD-24 Torque-Converter does half-again as much as the other rig!

Prove to yourself what a tremendous profit-earning advantage the Planet Power-steered TD-24 gives you over anything else on tracks. Compare the huge capacity increase Planet Power steering delivers on benching, whether on turns or straightaway. Add up the extra 'dozing passes you get per day from exclusive Hi-Lo shifting—and from high TD-24 reverse speeds. Ask your International Construction Equipment Distributor for your demonstration!

International® Construction Equipment

International Harvester Co., 180 N. Michigan Avenue, Chicago 1, Illinois

A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors... Self-Propelled Scrapers... Crawler and Rubber-Tired Loaders... Off-Highway Haulers... Diesel and Carbureted Engines... Motor Trucks... Farm Tractors and Equipment.

You save in many ways with TEL-O-SET transmitters

... today's most advanced pneumatic transmitters

Measure temperature, gage pressure *or* absolute pressure with the same accurate, highly responsive *Tel-O-Set* transmitter.

CUT INSTALLATION COSTS

Mount the transmitter anywhere, indoors or outdoors—it's weatherproof. Easily installed on wall, pipe or horizontal well.

CUT SPARE PARTS INVENTORY

Only one basic transmitter needed for all applications.
Adjust range without adding or changing parts.

SAVE IN MAINTENANCE

Long life inherent in rugged force-balance mechanism.
All working parts and adjustments protected by weatherproof cover.

Get complete details on *Tel-O-Set* transmitters, receivers, and controllers from your nearby Honeywell field engineer. Call him today . . . he's as near as your phone. MINNEAPOLIS-HONEYWELL, Wayne and Windrim Avenues, Philadelphia 44, Pa.

Honeywell

• **REFERENCE DATA:** Write for Catalog C100-1A, *"Tel-O-Set* Indicators, Recorders, Controllers".

H HONEYWELL *First in Controls*

The Eimco 630 Excavator **High Capacity Loading, rugged construction and low maintenance costs.**

"YOU CAN'T BEAT AN EIMCO"

This phrase, coined by thousands of Eimco users since Eimco introduced successful overhead loading 26 years ago, and used in mines throughout the world has been earned through an unexcelled, honest and dependable performance by machines always assigned to the task of hard severe service.

Robust, gadget-free, hell-for-stout construction that is typical of all Eimco Loaders is also found in the 630, pioneered by Eimco for every phase of trackless underground work.

Today the results speak for themselves. Hundreds of repeat orders from customers who have learned through their own experience — that the statement "You can't beat an Eimco" is a true fact.

An Eimco 630, similar to the machine pictured above, has loaded more than 375,000 tons at a verified average cost for maintenance of only 2.9 cents per ton loaded.

Yes! This is the type of heavy-duty equipment you get from Eimco — this is the equipment to buy to meet low metal prices and show a profit.

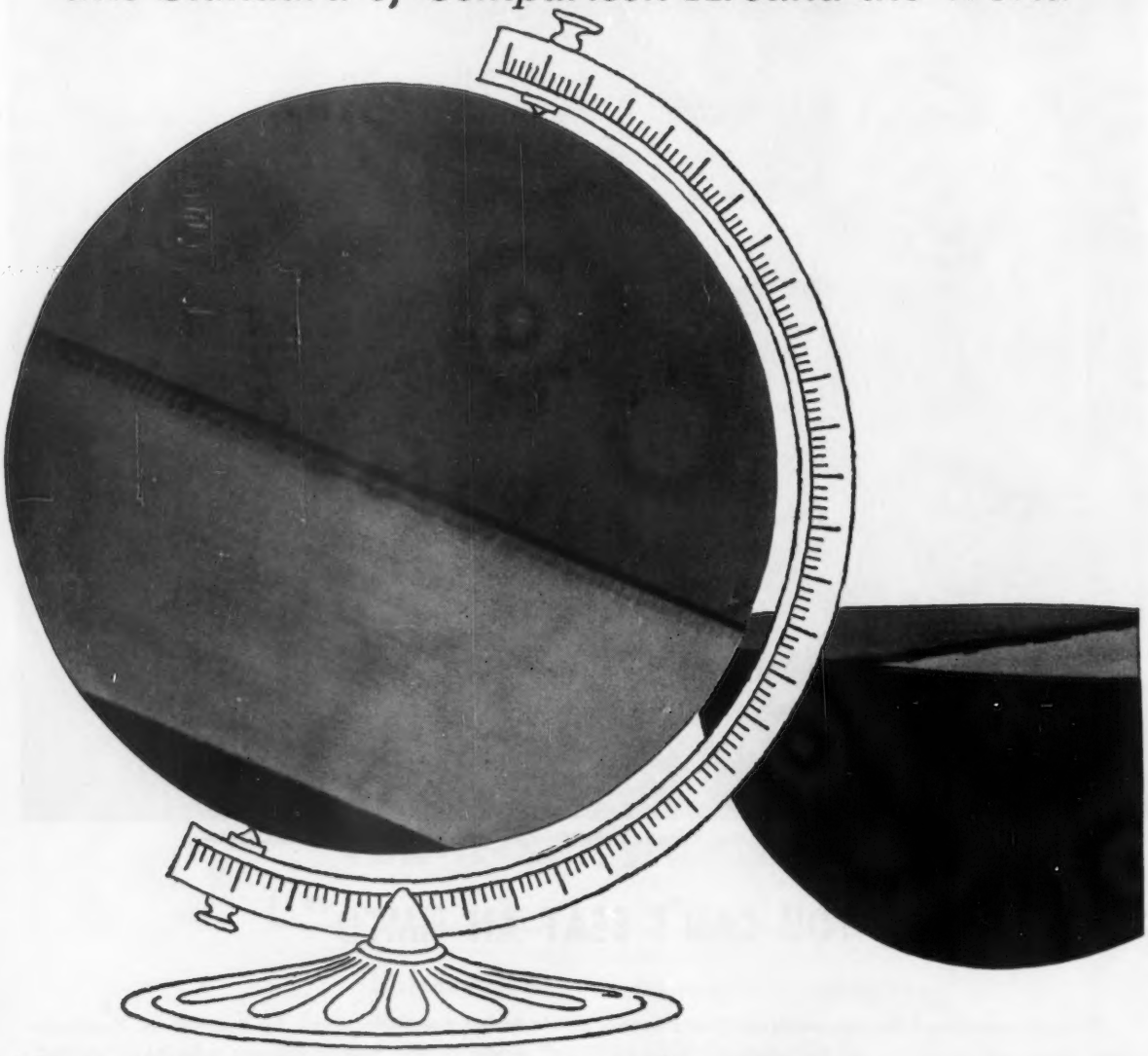
THE EIMCO CORPORATION

Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City

New York, N.Y. Chicago, Ill. San Francisco, Calif. El Paso, Tex. Birmingham, Ala. Duluth, Minn. Pittsburgh, Pa. Seattle, Wash.
Cleveland, Ohio London, England Gateshead, England Paris, France Milan, Italy Johannesburg, South Africa

B-329

The Standard of Comparison Around the World



hard and tough to the core...

Moly-Cop Grinding Balls have earned a reputation for long, economical service in the major mills of the world...and for good reason. The alloying, forging and heat treating by Sheffield assures an unvarying hardness and toughness to the core.

SHEFFIELD
ARMCO®
MOLY-COP
COPPER-MOLYBDENUM-ALLOY
Grinding Balls

SHEFFIELD DIVISION ARMCO STEEL CORPORATION SHEFFIELD PLANTS: HOUSTON • KANSAS CITY • TULSA
EXPORT REPRESENTATIVES, THE ARMCO INTERNATIONAL CORPORATION, MIDDLETOWN, OHIO

No. 7 in a series

Right off the Wire

An application of television shows a pilot the image of his plane superimposed on a map of the territory over which he is flying.

&

An X-ray inspection method for solid cast rocket fuels reveals any cavities or fissures that would interfere with burning.

&

A new machine at Simplex applies Condex Interlocked Armor over cable cores having diameters up to 4.5″.

&

An electronic guidance system will help river pilots to maneuver long strings of barges around the bends and under the bridges of the Mississippi.

&

A new facility for advanced research in thermonuclear reactions is expected to generate temperatures in the millions of degrees.

&

A land-mine exploder has been developed by the Army which will detonate buried explosives without damage to the exploder or the tank that carries it.

&

A new alkaline flashlight battery is said to last ten times as long as ordinary dry cells and to deliver more power.

&

A generator-powered flash-bulb holder is about the size of an electric razor. Half a turn of a wheel stores enough electricity in a capacitor to fire the bulb.

&

A television tube only five inches thick has been developed in England.

&

A process has been developed for electroplating copper on aluminum. The plating can be tinned, soldered or formed.

A new synthetic rubber is resistant to oils, fuels and solvents and retains its properties at temperatures as high as 400°F.

&

A new chemical compound slows the growth of any part of a tree without affecting the rest.

&

A new electronic instrument analyzes the sequence of chemical reactions in the burning of rocket fuels in one ten-thousandth of a second.

&

A single relay system across Canada from Halifax to Victoria will carry television programs and telephone conversations.

&

The floodlights at Niagara Falls have been redesigned to give ten times the illumination of the former twenty-five-year-old system with no increase in power consumption.

&

Further information on these news items and on Simplex cable is available from any Simplex office. Please be specific in your requests.

&

Among the United States exhibits at Brussels will be an outline of world history for the entire Christian era stored in a computer. Any item can be found in two-thirds of a second and printed in any one of ten languages.

&

The first digital computer fast enough to evaluate the performance of a missile in flight is said to be twenty-four times faster than preceding models.

&

A new X-ray technique reduces radiation exposure to a fraction of that now used for diagnosis.

&

A new truck transmission has twelve speeds in one gear box controlled by one lever.

A new machine can weigh and sort coins at the rate of 18,000 per hour with an accuracy of plus or minus one-fourth of one per cent.

&

A new desk-top machine covers one or both sides of documents with clear plastic film.

&

A device for practice in marksmanship shoots, instead of a bullet, a flash of light, which shows on the target.

&

An ultra-sensitive space speedometer measures acceleration in any direction.

A Simplex Laboratory

At the Simplex plant in Cambridge, six modern, well-equipped laboratories similar to the one shown here are devoted to the never-ending search for new, better materials and methods which result in new, better wire and cable products. Over the years, this program of concentrated, intensive research has brought about a great number of the most important technical advances and product improvements that have made Simplex the leader in the wire and cable industry.

SIMPLEX WIRE & CABLE CO.
Cambridge, Massachusetts and
Newington, New Hampshire

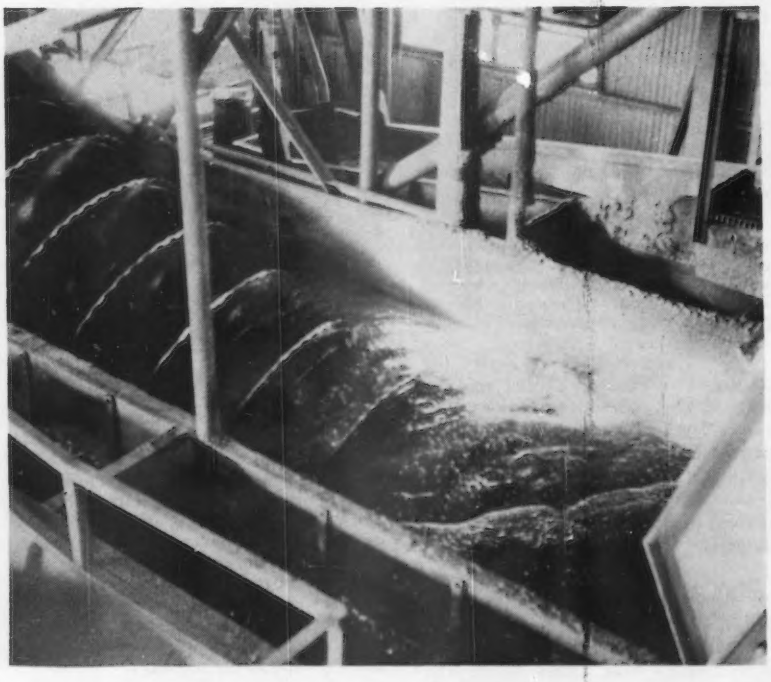
Simplex

Highest quality cables for: Mining
Power & Lighting • Construction
Transportation • Communications
Signalling

"The American manufacturers of transoceanic telephone cables"

Kaiser Selects an AKINS HMS Separator For Iron Ore

The Kaiser Steel Corp. made extensive tests using an Akins HMS Pilot Separator to improve the operation of its Eagle Mountain heavy media plant. As a result an 84″ Akins Separator was installed to handle 300 tons per hour.



90% Recovery

This hematite iron ore contains a considerable amount of magnetite residual after magnetic separation. The iron content of the heads is sometimes as low as 25 per cent Fe with an average of 37 per cent Fe. The concentrates average about 60 per cent Fe with tailings of about 10 per cent Fe. Iron recovery averages better than 90 per cent.

When iron content of heads increases, a middlings product, containing better than 20% iron, is drawn, recrushed, and returned to a jig circuit, further increasing recovery of iron. With the Akins Separator this is accomplished with just one medium circuit.

Akins HMS Pilot Testing Units *are available for purchase or rental.*

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P. O. Box 9041 • 3800 Race • Denver 16, Colorado

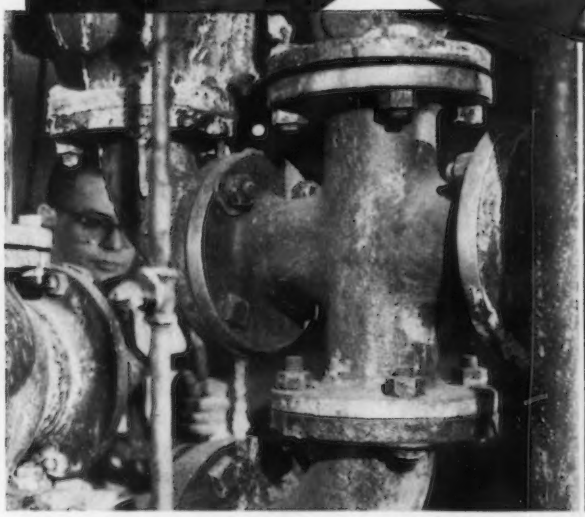
Akins Dewatering Classifiers, Skinner Multiple Hearth Dryers

Sales Agents and Licensed Manufacturers in Foreign Countries

A SUBSIDIARY OF THE MINE & SMELTER SUPPLY CO.

"ESCO FITTINGS HAVE LASTED SIX TIMES LONGER and still show no possible sign of failure"

Mr. D. Baker, operating superintendent, inspects ESCO fittings installation.



. . . reports the Bunker Hill Co., Kellogg, Idaho.

"About seven years ago," explains The Bunker Hill Co. Electrolytic Zinc Plant Maintenance Superintendent C. H. Neubauer, "we started replacing our fittings, as they failed, with *ESCO* Alloy 45S (Type 316) stainless fittings. We are getting anywhere from six times to indefinitely longer service life from the *ESCO* fittings. The cost of *ESCO* fittings is no more, and in some cases even less than the fittings we were previously using."

These fittings carried a corrosive slurry containing zinc sulphate in the electrolytic zinc plant.

You can solve your problems due to corrosion, heat and abrasion with ESCO Stainless Steel Fittings. They are available in a wide range of alloys. Call or write your *ESCO* dealer or an *ESCO* engineer today for an analysis of your fittings requirements.

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MFG. PLANTS AT PORTLAND, ORE. AND DANVILLE, ILL.

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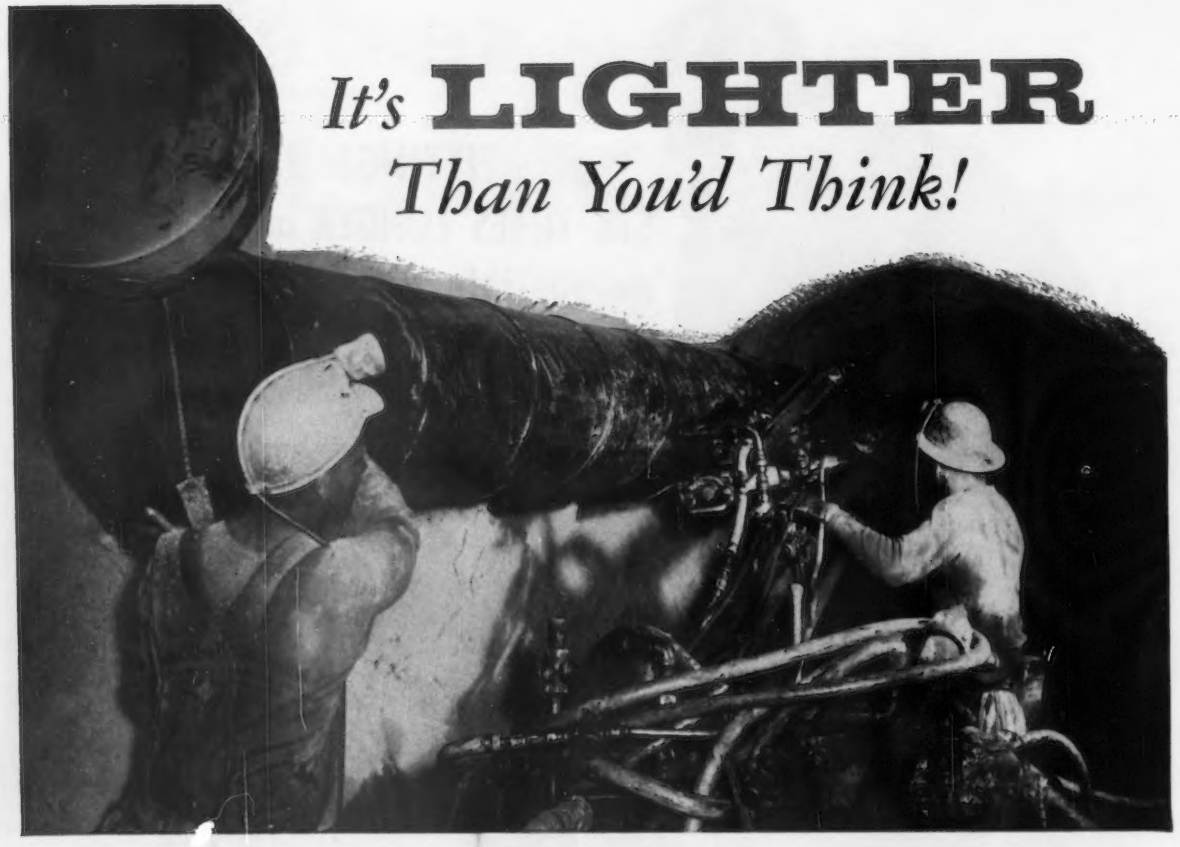
It's LIGHTER *Than You'd Think!*



How NAYLOR Combines Built-in Strength and Safety With the Economies of Light Weight

There's good reason why NAYLOR Spiralweld pipe gives you performance you'd expect only from heavier pipe.

NAYLOR'S exclusive spiral-lockseam structure makes this possible. It provides the extra collapse strength and safety necessary for heavy-duty service. Yet its light weight assures easier handling. Installation is faster, too. You save even more time and work when you use the one-piece NAYLOR Wedgelock coupling to speed connections.

Note how NAYLOR pipe hugs the wall—and how easily lines can be extended with only one side of the pipe in the open.

For moving air, water or tailings—it will pay you to consider the extra performance built into NAYLOR pipe.

To get full details, write for Bulletin No. 507

NAYLOR

NAYLOR PIPE COMPANY

1243 East 92nd Street, Chicago 19, Illinois

Eastern U.S. and Foreign Sales Office
60 East 42nd Street, New York 17, N. Y.

CYANAMID

REAGENT NEWS

"ore-dressing ideas you can use"

Three Typical Examples of Effective Copper Collection with Cyanamid Flotation Reagents

Proven most efficient and economic, these Cyanamid flotation reagent combinations have stood the test of time at three typical copper flotation operations.

MINE A

Using SODIUM AEROFLOAT® Promoter since 1948, started up on AEROFLOAT® 208 Promoter in 1941 and now treats 51,000 tpd of chalcocite ore with some pyrite and molybdenite (heads 0.9% Cu). Grind is 8.5% on 65 mesh with middlings reground. SODIUM AEROFLOAT dosage is 0.023 lb/ton, frother a mixture of cresylic acid (0.06 lb/ton) and fuel oil (0.003 lb/ton). Lime at 4 lb/ton helps depress pyrite. MoS_2 is also recovered using sodium ferrocyanide, together with sodium cyanide, as copper depressants. Concentrate runs 25% Cu, tails 0.18% Cu (with 0.12% oxide). Moly concentrate runs 89% MoS_2 and under 0.5% Cu.

MINE B

Has been using Cyanamid Reagents exclusively since start-up in 1955. It mills 12,000 tpd of chalcopyrite ore (heads 0.9% Cu) containing some pyrite and molybdenite. Collector in preliminary copper circuit (making a high-grade concentrate) is AEROFLOAT 238 Promoter at 0.016 lb/ton with mixture of AEROFROTH® 70 and 65 Frothers (4 to 1 ratio with F-70 at 0.03 lb/ton). Bulk copper-pyrite float follows utilizing 0.015 lb/ton AERO® Xanthate 301 with small amount AEROFROTH 65-70 combination. Chalcopyrite is selectively floated from pyrite in bulk concentrates with 8 lb/ton lime and 0.05 lb/ton AERO® Brand Cyanide, no additional promoter. Copper concentrate runs approximately 26% with tailings 0.08% Cu. Moly recovery not attempted at present time.

MINE C

Our first liquid AEROFLOAT customer—has been using liquid AEROFLOAT Promoters for over 30 years. Mill tonnage is 6,500-6,800 tpd copper-bearing magnetite ore with 3,300 to 3,600 tons going to chalcopyrite and pyrite flotation. Copper-magnetite middling product is floated from magnetite concentrate with approximately 0.16 lb/ton AEROFLOAT 33 Promoter. Tailings from magnetite recovery and the copper-magnetite middlings are reground and floated using a combination of AEROFLOAT 15 (0.083 lb/ton) and AERO Xanthate 301 (0.003 lb/ton) together with 0.01 lb/ton NaCN, 1.5 lb/ton lime as pyrite depressants to make final copper concentrate running 25.5% Cu. Pyrite is then floated with AERO Xanthates 303 and 343 (approximately 0.04-0.06 lb/ton each) and 0.03 lb/ton pine oil. Pyrite concentrate runs approximately 49% S.

AEROFLOAT Promoters, AERO Xanthates and AERO Promoter 404, proven as copper promoters over many years, are still the preferred collectors in today's copper milling operations. A review of your flotation practice and reagent combinations could bring profitable rewards. A Cyanamid Field Engineer will be glad to work with you.

AMERICAN CYANAMID COMPANY

EXPLOSIVES AND MINING CHEMICALS DEPARTMENT

CYANAMID INTERNATIONAL — *Mining Chemicals Department*
Cable Address: Cyanamid, New York

30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

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Where the going gets rough...

get tough

with Lukens "T-1" Steel!

TRADE-MARK

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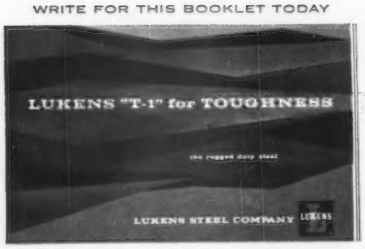
■ Wherever rock and gravel, coal and ores come in violent contact with machine and equipment parts, Lukens "T-1" steel—*especially extra tough 321 min. BHN quality*—fights back at wear and abrasion with spectacular success.

It is readily fabricated. You can form or weld it in the field or shop, from stock plate sizes immediately available. It can be used to replace or repair worn bucket teeth, truck and mine car bodies or liners, dozer blades, dipper sticks, crusher teeth, chutes, and many other parts.

Far stronger for its gage than conventional steel, it requires less metal to do equivalent jobs. It remains tough even at sub-zero temperatures.

Contact your nearest warehouse listed below, or write Manager, Marketing Service, 143 Lukens Building, Lukens Steel Company, Coatesville, Pennsylvania. Ask for special bulletin, *"Lukens 'T-1' for Toughness."*

WRITE FOR THIS BOOKLET TODAY



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REALLY HOT MATERIALS

KILN DISCHARGE . . . SINTER . . . CLINKER
CASTINGS . . . DROSS . . . UP TO 1800°F!

- **Heavy Conveying Troughs** — ½" thick and heavier. Widths to 6', lengths to 500'. Easily vibrated in 1" stroke by rugged coil springs and single patented Carrier Natural-Frequency Drive.
- **Expandable Trough Sections** — Each 5' trough section attached by spring-loaded bolts through slotted holes. Sections expand independently of each other and of conveyor's structural members.
- **No Leakage** — A continuous one-piece dribble trough (not shown) mounted several inches below the conveying trough collects any fines which may leak through the conveying trough sections.
- **Replaceable Trough Sections** — New conveying trough sections easily installed. Little delay. Convenient replacement principle cuts costly down-time.
- **Heat-Resistant Materials** — Alloy and stainless steels resist warping and high-temperature scaling. Low abrasive wear due to gentle conveying action.
- **Quenching or Cooling** — Can be accomplished by direct or indirect water spray, plate-coil deck, or air.
- **Heat-Protected Drive** — Heat protection provided by heat shield, dribble trough, and flexibility of location.

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CONVEYORS

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Please rush full information on Carrier Natural-Frequency High-Temperature Conveyors.

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World's largest hopper cars with automatic clamshell doors cut River Queen Coal's switching costs more than 25%

Thirty huge coal-type hopper cars of 100-ton capacity built by Baldwin-Lima-Hamilton's Eddystone Division are now transporting washed coal from the mine to the plant at the River Queen Coal Company's properties in Greenville, Ky.

Weighing 65,000 lb., and with a level full capacity of 119 cu. yd. and a heaped capacity of 140, these are the largest coal cars ever equipped with the automatic clamshell door mechanism, a patented device which provides instantaneous dumping. Since three of them haul more coal than four 70-ton cars, these 100-ton giants reduce switching costs more than 25% on main line tracks, where charges are based solely on a per car rate.

Thirty-five similar cars for the Kansas City Power & Light Company, Kansas City, Mo., are now being built at Eddystone.

Made in all capacities and track gages, Baldwin hopper cars are noted for their long life and trouble-free service.

The world's largest selling dump car—the Western—is also built by B-L-H. Write us today for complete information on both dump and hopper cars.

Down shot shows car's rugged ribbed construction and enormous size.

Air-operated clamshell door is tested on one of 30 new 100-ton coal-type hopper cars built by the Eddystone Division of B-L-H for the River Queen Coal Company.

BALDWIN · LIMA · HAMILTON

Eddystone Division

Philadelphia 42, Pa.

Hydraulic turbines • Weldments • Dump cars • Nonferrous castings • Special machinery • Bending rolls • Machine tools

Lifting heavy beams for steel-skeletoned skyscrapers, over the heads of pedestrian and vehicular traffic, calls for careful loading — with safe slings, stout wire rope and a crane that's securely guyed with steel cables. Structural steelworkers practice safety because they know that...

life depends on it

Today, taller buildings, bigger bridges, deeper oil wells, greater construction projects require stronger, safer wire rope. And equipment operators know that when you buy "bargain" rope you're heading for headaches, trouble and expense. So don't bargain with safety. Buy wire rope on the basis of *quality*. Buy Wickwire Rope.

5696

WICKWIRE ROPE — A CF&I PRODUCT

CF&I

LOOK FOR THE YELLOW TRIANGLE

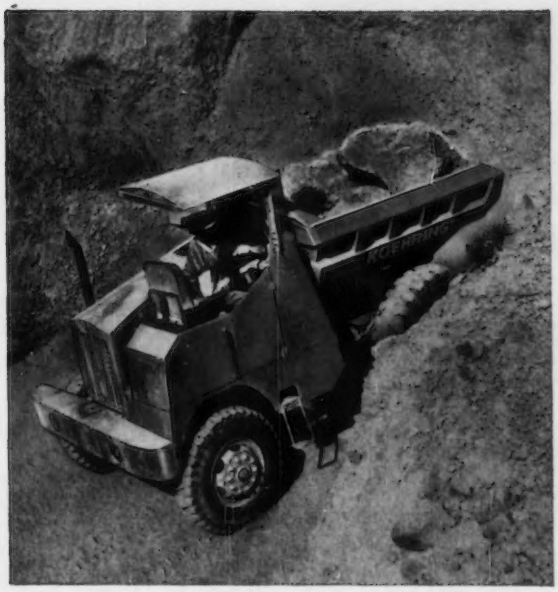
PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL AND IRON CORPORATION

THE COLORADO FUEL AND IRON CORPORATION—Albuquerque • Amarillo • Billings • Boise • Butte • Denver El Paso • Farmington (N. M.) • Fort Worth • Houston • Kansas City • Lincoln (Neb.) • Odessa (Tex.) • Oklahoma City Phoenix • Pueblo • Salt Lake City • Tulsa • Wichita • **PACIFIC COAST DIVISION**—Los Angeles • Oakland • Portland San Francisco • San Leandro • Seattle • Spokane • **WICKWIRE SPENCER STEEL DIVISION**—Boston • Buffalo • Chattanooga Chicago • Detroit • Emlenton (Pa.) • New Orleans • New York • Philadelphia

MINING WITH DUMPTORS

...in open pits...and underground

Follow Koehring Dumptor through a typical load-haul-dump cycle, and you'll quickly see why it has gained such wide acceptance on all kinds of mine hauling, stockpiling, feeding hoppers, etc. First, notice how it saves time at the loader (above). Wide-flared 6-yard body, with low height, provides a big square target — *64 square feet, to be exact* — for loading over either side or end by shovel, dragline or front-end loader. On the haul, Dumptor travels at the same speeds in either direction. *There's no need to turn* — an important advantage when working along narrow ledges, overhead trestles, tunnels, etc. It accelerates fast, climbs 24% ramps or grades with capacity load. That's because there's better than 6 H.P. of *"go"* for every ton of loaded weight. At the dump area, *gravity* tilts the body, dumps the load *in one second*. There's no 15 to 25-second wait for slow-acting mechanical body-hoist — and no expensive hoist maintenance, because *gravity-dump* never balks, never wears out. You get all these advantages *and more* when you haul with heavy-duty Dumptors. See your local Koehring distributor about a demonstration, or write to us for the latest Dumptor® catalog.



Up-grade all the way — Near Mexico, D.F., 3 Dumptors haul rock and sand 600 feet up-hill from mine to hopper. In spite of steep, winding road, and normal loading delays, each Dumptor averages 150 loads per 12-hour day. These heavy-duty, 6-yard haulers, with their high ratio of H.P.-to-weight, can climb mine grades as steep as 24% fully loaded.

Dump time: 1 second — At hillside hopper, Dumptor drives up, body forward. Operator trips a body-release lever, and *gravity* tilts the body — dumps the load instantly. Free-swinging kick-out pan breaks load suction for fast, clean dump when hauling wet, sticky materials — bolts down to floor of dump body when handling heavy boulders like this.

Shuttles underground — There's no room to turn in this mine tunnel, and no need to turn. Koehring Dumptor drives up, gets its load, then shuttles back out of tunnel at the same speed as it entered. It operates with equal ease and speed in either direction — is as efficient underground as it is on inclined ramps, overhead trestles, or hauling on the surface.

An inside job — To save rehandling of materials, 2 Dumptors haul clay from pit to processing plant, dump directly into hoppers inside the plant. Convenient end-dump, and no-turn shuttle hauling are especially practical on operations like this, eliminate turning and spotting in crowded work-areas. Handy, too, for stockpiling, and loading rail cars.

KOEHRING DIVISION OF KOEHRING COMPANY • Milwaukee 16, Wis.

KOEHRING HEAVY DUTY

E765

"A drop in the bucket!" The constructions shown here by Tom Weichel, Okonite's chief mining engineer, are just a random sampling of the cables that Okonite has developed for mining operations. More than likely, Okonite has available right now the exact cable you need—in terms of toughness, flexibility, capacity, resistance to oils, acids, alkalies, mine water and high heat. If not . . . we know how to build it!

Here's how we add value to your cable dollar

Behind these cable constructions are service records that prove the extra long life of Okocord portable cables in the face of continual high-speed reeling, rock falls, run-overs and constant dragging over mine floors and around sharp corners.

Longer cable life means lower operating costs . . . reduction of costly work stoppages . . . greater utilization of expensive equipment. Truly, Okocord represents money in the pocket for any mine operator.

Here's how Okonite assures maximum value for your cable dollar:

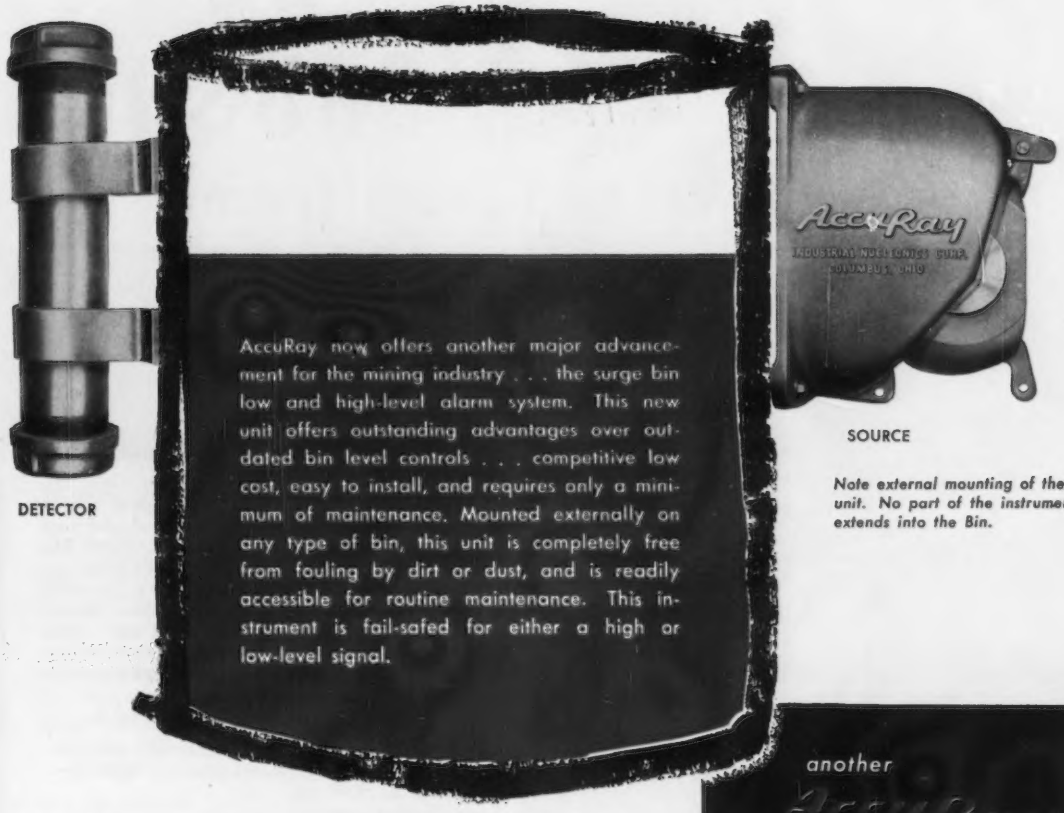
1. By the use of materials developed in 80 years of making the finest cables.
2. By constant research to find even better materials and constructions.
3. By intimate, first-hand knowledge of mining problems and conditions.
4. By self-imposed standards for manufacturing and testing that are more exacting than the industry requires.

There is an Okonite quality cable for your shovels, drills, shuttle cars, continuous miners and other equipment. There are Okonite specialists ready and willing to help you in the planning or installation stages. And there is a brand new booklet full of valuable hints on picking the right cable constructions for your all-important power or control circuits. Write for free Bulletin EM-1117—"How to choose insulated cable"—to The Okonite Co., Passaic, N. J.

where there's electrical power . . . there's **OKONITE CABLE**

6128

AccuRay® BIN LEVEL DETECTOR-CONTROLLER



DETECTOR

SOURCE

Note external mounting of the unit. No part of the instrument extends into the Bin.

AccuRay now offers another major advancement for the mining industry . . . the surge bin low and high-level alarm system. This new unit offers outstanding advantages over outdated bin level controls . . . competitive low cost, easy to install, and requires only a minimum of maintenance. Mounted externally on any type of bin, this unit is completely free from fouling by dirt or dust, and is readily accessible for routine maintenance. This instrument is fail-safed for either a high or low-level signal.

another AccuRay® *advancement for process control*

The AccuRay Bin Level Detector-Controller can be used in two ways. It can be installed horizontally to provide a relay closure signal when the level rises above or falls below the level of the detector; or it can be installed vertically so that both a high level and a low level signal can be provided from one instrument. The radiation source is installed either opposite the detector, or across a chord of the Bin. The design of the source housing provides more than adequate shielding. Design of the instrument is in accordance with accepted standards for both explosion-proof and weatherproof operation.

®AccuRay is a Registered Trademark of Industrial Nucleonics Corporation

Industrial Nucleonics
CORPORATION
1151 Chesapeake Ave., Columbus 12, Ohio

Please send complete details on AccuRay Tank Level Detector-Controllers.

Name ..... Title .....

Company .....

Street .....

City ..... Zone ..... State .....

Application .....

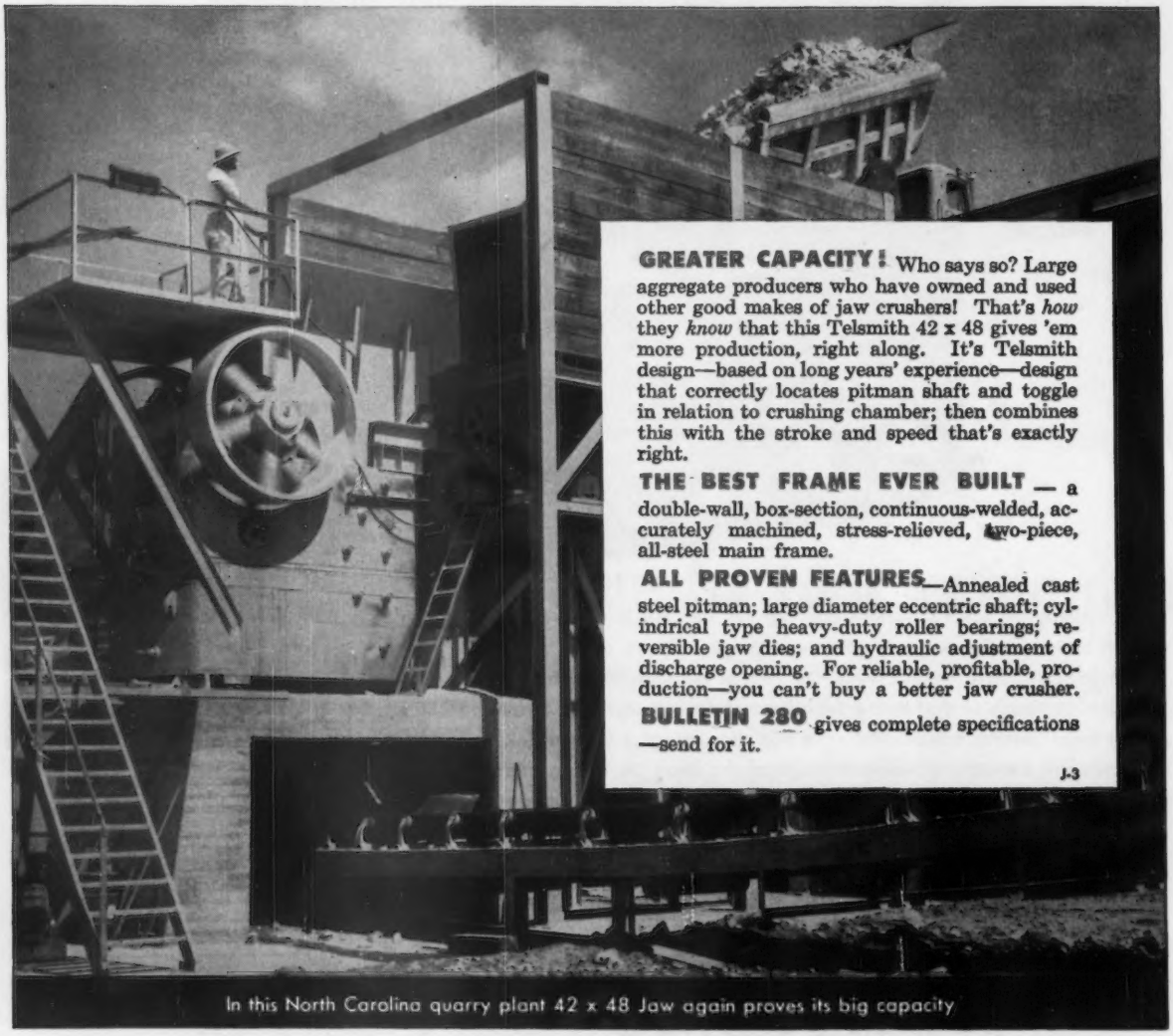
.....

The WORLD'S LARGEST Manufacturer of Nucleonic Industrial Process Control Systems

TELSMITH

42" x 48" JAW CRUSHER

with welded steel frame



GREATER CAPACITY! Who says so? Large aggregate producers who have owned and used other good makes of jaw crushers! That's *how* they *know* that this Telsmith 42 x 48 gives 'em more production, right along. It's Telsmith design—based on long years' experience—design that correctly locates pitman shaft and toggle in relation to crushing chamber; then combines this with the stroke and speed that's exactly right.

THE BEST FRAME EVER BUILT — a double-wall, box-section, continuous-welded, accurately machined, stress-relieved, two-piece, all-steel main frame.

ALL PROVEN FEATURES—Annealed cast steel pitman; large diameter eccentric shaft; cylindrical type heavy-duty roller bearings; reversible jaw dies; and hydraulic adjustment of discharge opening. For reliable, profitable, production—you can't buy a better jaw crusher.

BULLETIN 280 gives complete specifications —send for it.

J-3

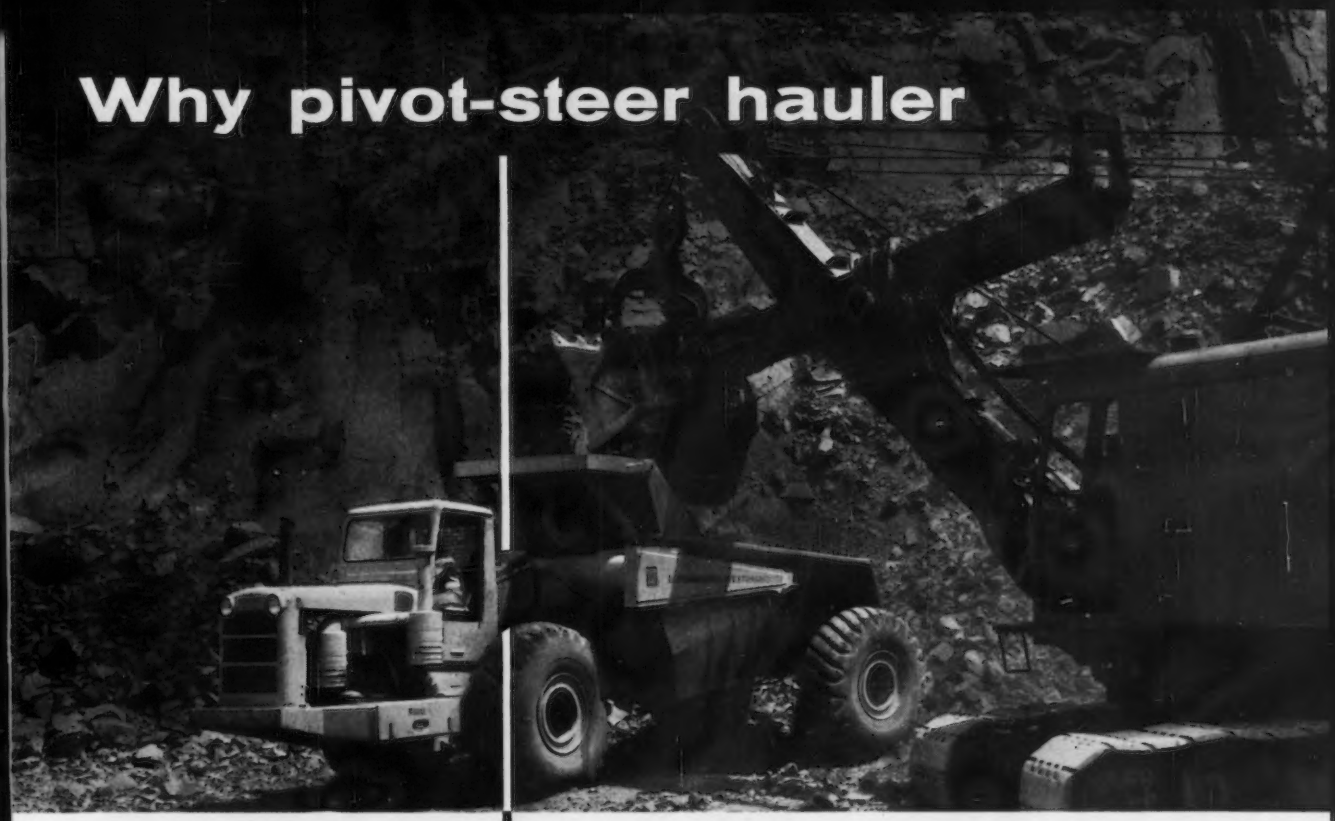
In this North Carolina quarry plant 42 x 48 Jaw again proves its big capacity

SMITH ENGINEERING WORKS

502 E. CAPITOL DRIVE **MILWAUKEE 1, WISCONSIN**

Representatives in Principal Cities in All Parts of the World • **Cable Address: Sengworks, Milwaukee**

Why pivot-steer hauler



cuts equipment downtime... boosts pit output... lowers handling costs...

Rugged, simplified construction is one big reason why speedy LeTourneau-Westinghouse Tournapull® Rear-Dumps keep working efficiently day after day... year after year... to help pit owners cut costs. Notice that on this machine there are no springs, no tie rods, no hose and pipe lines, no frame, no long drive-shaft to require maintenance and repair.

In place of a foundation frame and body sub-frame, Tournapull prime-mover and trail-unit are hitched together by means of a high horizontal yoke. Yoke pivots horizontally on kingpin at front... then extends back along side of bowl, where it pivots vertically just above and ahead of rear wheels. This unique vertical and horizontal kingpin arrangement also provides an easy oscillating action that eliminates most twisting, tilting strains ...permits higher working speeds on uneven ground to boost pit output.

Resists heaviest loading jolts

Shovel operator does not have to take it slow and easy when loading heavy materials. L-W Rear-Dump bowl is all steel — no wood fillers. Triple-layer floor is lined with heat-treated tool-steel strips, welded to solid billets laid over heavy steel plate. Sloping sides deflect load shock, quickly cushion floor area with layer of material to minimize rock damage.

Tire, clutch, transmission wear reduced

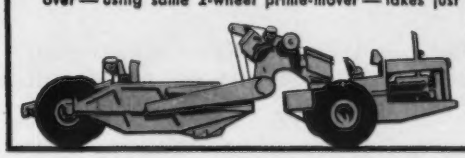
Costly wear on tires, clutch, and transmission caused by spinning wheels in slippery or loose footing, is minimized with Tournapull Rear-Dump. When either powered wheel begins to spin, unit's exclusive L-W power-transfer differential automatically diverts up to 80% of power to drive wheel on firmest footing. Also, electric 90° pivot-turn through geared kingpin, lets operator "walk" prime-mover out of mud or loose sand. Dumping action can also be used to "hump" empty hauler off a soft bank.

Features like these — plus full 90° turns, efficient electric-controls, fast, clean dump, giant air brakes, excellent visibility — add up to high production and low costs. Let us show you a LeTourneau-Westinghouse Tournapull Rear-Dump in action. Available in 3 sizes: 11, 22, and 35 tons.

R-1892-MQ-1

Bonus interchangeability feature

For less than ¼ the cost of an L-W Tournapull prime-mover with Rear-Dump, you can get an easy-loading L-W scraper to interchange with original Rear-Dump trail-unit. Changeover — using same 2-wheel prime-mover — takes just a few hours. Use scraper to lower dirtmoving costs on stripping operations, haul-road or drainage construction, and for exploratory mining. Other trail-units to increase prime-mover's usefulness also available.



LETOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit.

NEW AMSCO 2-PART TOOTH

Special-alloy reversible tips *(easy to reverse)* nearly double tooth digging life...

In quarry work, in cold and hot slag pits . . . in the roughest of digging tests, these new Amsco® 2-part Simplex teeth have outlasted competitive 2-part teeth more than 2 to 1 . . . at a big saving in tip and adapter replacement time.

You get this longer wearing quality because of the special, rugged alloy used for both tip and adapter. Reversing tips extends digging life even more, yet takes only a few minutes.

Adapters outlast several sets of tips, are equally easy to replace. Pin lock between tip and adapter seats and locks so securely, metal-to-metal, that even side blows can't jar it loose.

We'll be glad to send you a booklet containing reports by Simplex users and describing this new Amsco tooth completely. Write for it today.

AMERICAN Brake Shoe COMPANY

AMSCO

American Manganese Steel Division · Chicago Heights, Illinois

Mine owners enjoy three-way satisfaction from BUCYRUS-ERIES . . . You Can, Too

Like hundreds of mine owners throughout the country in pit operations like these, you can get complete satisfaction from fast-moving, economical, dependable Bucyrus-Erie 38-B and 51-B shovels and draglines. Look over these job pictures; check the material being excavated. Whether stripping overburden or loading ore, Bucyrus-Eries assure you:

High output, through swift dig-swing-dump cycles, smooth flow of power, accurate responsive control.

Low operating cost, proved by month after month of steady production with little downtime for maintenance. Parts are simple, large, few in number . . . engineered to work at capacity without overstress or strain. It all adds up to:

Dependability! Day after day, year after year . . . efficient working ability through careful balance of speed, power and weight.

Start now to enjoy this three-way satisfaction. Let your Bucyrus-Erie distributor give you complete information on these shovels and draglines.

549E58C

BUCYRUS ERIE

A Familiar Sign at Scenes of Progress

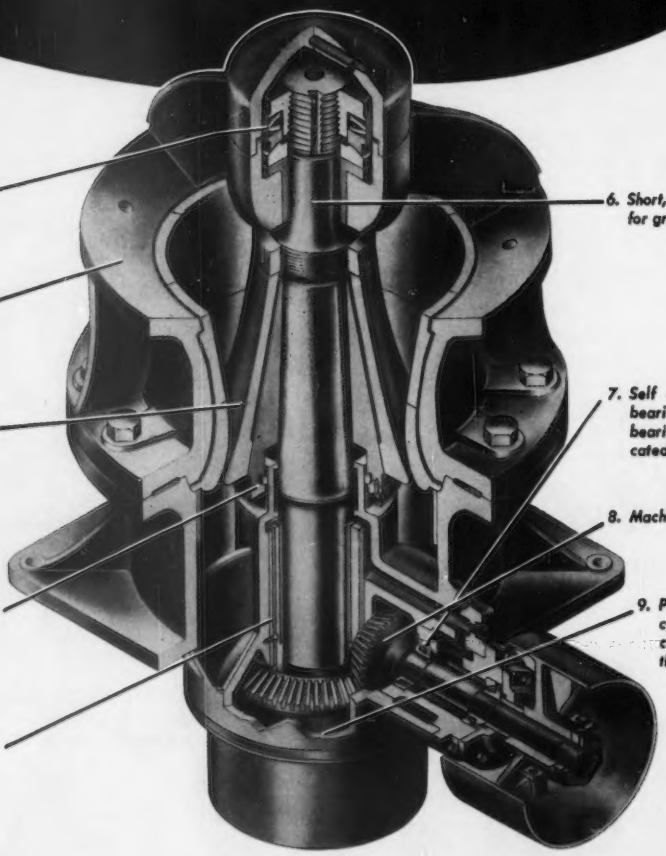
BUCYRUS-ERIE COMPANY • SOUTH MILWAUKEE, WISCONSIN

AT CARTERSVILLE, GA., a 2-yd. 51-B dragline excavates Red Float iron ore for hauling to the Hodge Mining Co. mill.

NEAR BATESVILLE, ARK., Miller-McGee Manganese Co. uses a 1½-yd. 38-B shovel to load trucks for haul to manganese washer.

NEAR BUHL, MINN., Johnson and Moore get rugged pit performance from a 2-yd. 51-B shovel loading iron ore.

Traylor -MADE TY GYRATORY CRUSHER



1. *Spring suspension affords protection against tramp iron.*
2. *Cast steel frame with spider and upper shell cast integral.*
3. *Self-tightening Bell Head and Curved Concaves, of manganese steel.*
4. *Traylor dust seal excludes dust and grit from the lubrication chamber.*
5. *Bronze bushed eccentric assures longer life.*
6. *Short, extra heavy main shaft for greater strength.*
7. *Self - contained countershaft bearing, fitted with roller bearings, automatically lubricated.*
8. *Machine cut steel gearing.*
9. *Positive and automatic lubrication system, either self-contained or located outside the crusher.*

Above are some of the outstanding features of the Traylor TY Gyratory Crusher. The TY Crusher enables operators to secure large tonnages of small product, of uniform size, with low percentages of oversize and waste fines. Write for bulletin No. 8112 today!

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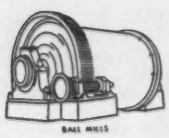
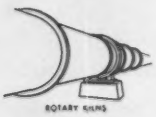
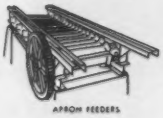
Traylor



BALL MILLS

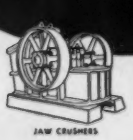


ROTARY KILNS



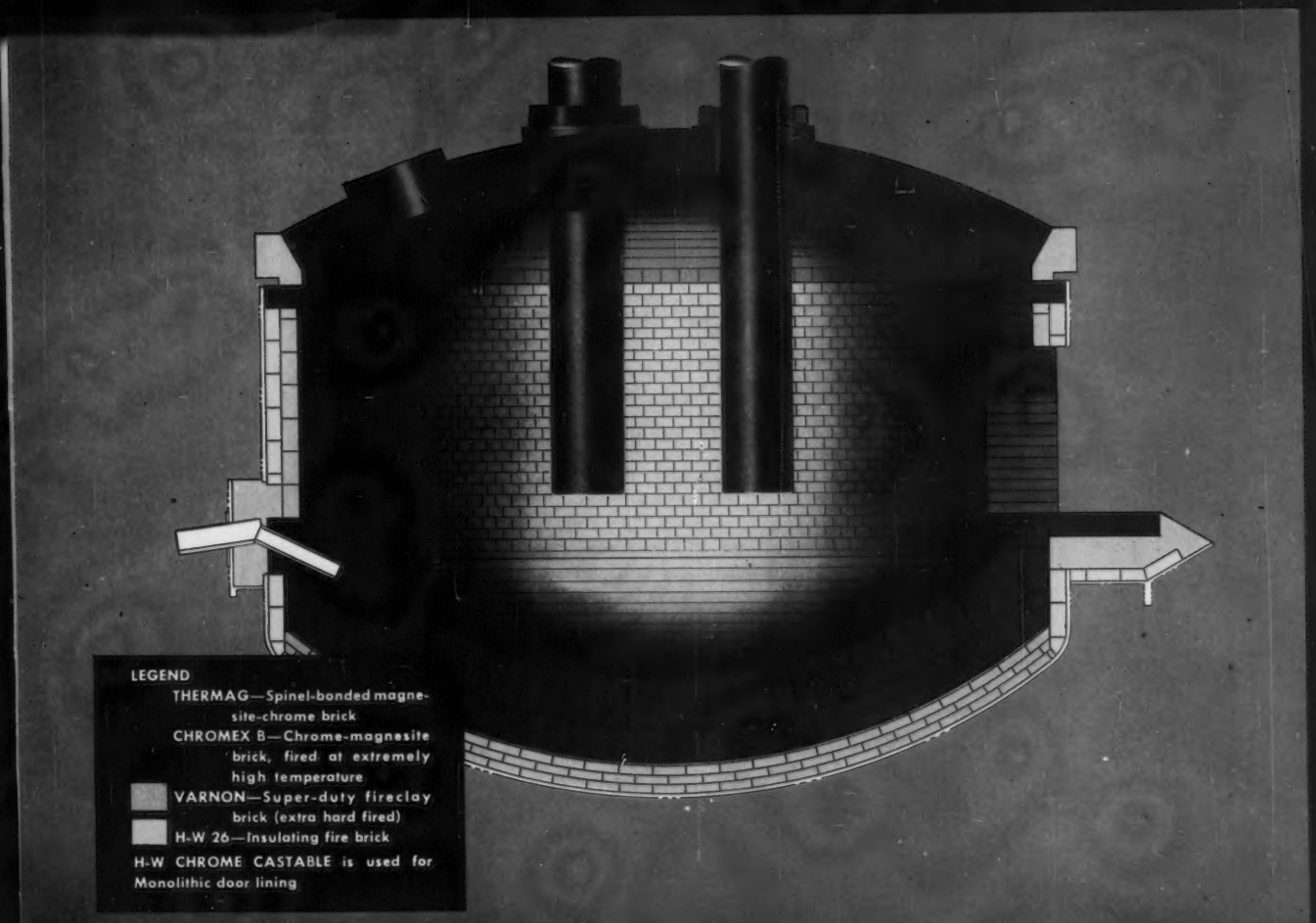
APRON FEEDERS

PRIMARY GYRATORY CRUSHERS



JAW CRUSHERS

SECONDARY GYRATORY CRUSHERS


LEGEND
THERMAG—Spinel-bonded magnesite-chrome brick
CHROMEX B—Chrome-magnesite brick, fired at extremely high temperature
VARNON—Super-duty fireclay brick (extra hard fired)
H-W 26—Insulating fire brick
H-W CHROME CASTABLE is used for Monolithic door lining

Harbison-Walker refractories used in the world's largest

ELECTRIC COPPER MELTING FURNACE

at American Smelting and Refining Company, Perth Amboy, New Jersey

Exterior view of world's largest electric copper melting furnace (courtesy of ASARCO)

The Harbison-Walker refractories which are particularly suited for use in the different furnace positions as here graphically illustrated, assure long, economical service. These brands are making records in electric copper melting furnaces at various refining plants.

THERMAG and CHROMEX B brands are selections for this electric furnace requirement, from a full score of Harbison-Walker basic refractories, many of which are widely used in copper smelting and refining practice. Among these, several of the leaders are:

- CHROMEX B—giving outstanding service in anode and wire-bar furnace side walls and in converters.
- METALKASE—steel encased basic brick, both plain and internally plated. Made in various sizes and in suspended arch shapes used for roofs of refining and matte smelting furnaces.
- H-W MAGNESITE—consisting predominantly of stabilized periclase. This brand of refractory provides the most strongly basic linings for greatest resistance to severe fluxing by basic slags.

In addition, Harbison-Walker products include all types and classes of refractories for every metallurgical furnace need.

HARBISON-WALKER REFRACTORIES CO.

AND SUBSIDIARIES — GENERAL OFFICES: PITTSBURGH 22, PENNSYLVANIA

World's Most Complete Refractories Service

Drilling river-bottom limestone for Amherstburg Channel

This huge drill boat, the M-1, using Bethlehem Hollow Drill Steel, is operating in the lower Amherstburg Channel of the Detroit River, near Amherstburg, Ontario. It is drilling and blasting rock in preparation for dredging in modernizing the Connecting Channels of the Great Lakes.

Great Lakes Dredge & Dock Co. is one of the contractors on this phase of the Great Lakes Connecting Channels project. Working under the supervision of the U. S. Army's Corps of Engineers, Detroit District, they are moving about 897,000 cu yd of medium-hard limestone in deepening the westerly half of the existing 600-ft wide channel from 21 ft to 28.5 ft. In drilling holes averaging 9 ft in depth, the 3-in. round Bethlehem Hollow has given its usual dependable performance.

Bethlehem Hollow is rolled from fatigue-resistant steel. It has a uniform hole, centrally located in the bar. It also has a wide quenching range, and can be heat-treated easily for the proper balance of toughness and wear-resistance.

Bethlehem Hollow comes in standard sizes of rounds, hexagons and quarter octagons in both Carbon and Ultra-Alloy grades. It is furnished in lengths of from 18 ft to 27 ft. Call us about your requirements.

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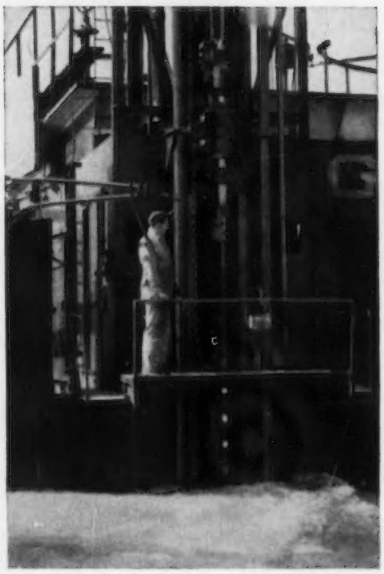
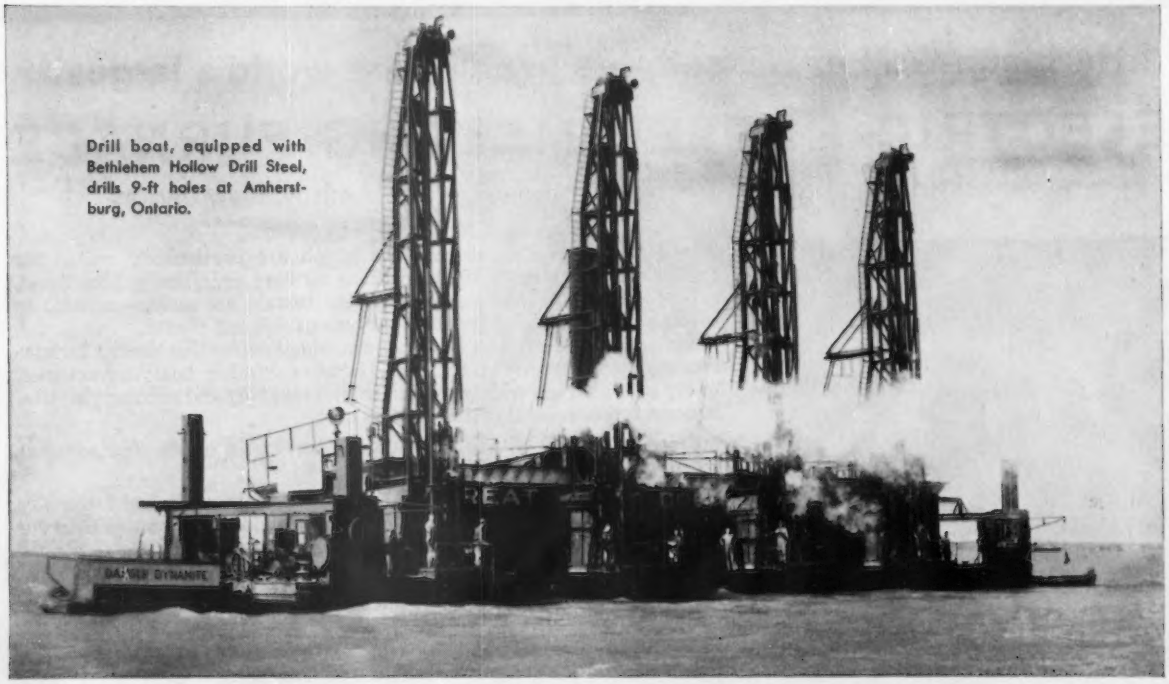
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation



Contracting officer: Col. Peter C. Hyzer;
Resident Engineer: Fred Smith;
Project Engineer: M. E. Lemmerhirt.



Drill boat, equipped with Bethlehem Hollow Drill Steel, drills 9-ft holes at Amherstburg, Ontario.

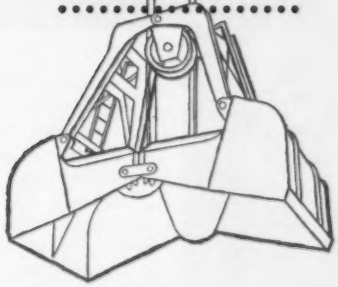
BETHLEHEM HOLLOW DRILL STEEL

CARBON AND ULTRA-ALLOY

INDUSTRIAL BROWNHOIST

OPEN TYPE COAL AND ORE GRAB BUCKETS CARRY BRIMMING PAYLOADS...

EVERY BITE!



Built to the same rigid standards of quality as are all INDUSTRIAL BROWNHOIST machines, these open-type coal and open-type ore buckets are designed for perfect weight distribution, to increase the payload.

Simplified construction makes upkeep simple. Annealed steel castings, alloy steel shapes and plates assure a lifetime of powerful service. I-B open-type coal grab buckets range from 84 to 480 cu. ft. capacities; ore buckets from 120 to 275 cu. ft. . . . and in custom designs where necessary for special requirements.

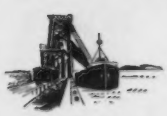
For further information on I-B job-engineered buckets —open type grab, link type, flush link type and clamshell—write for your copy of new catalog 574, just off the press. It gives you complete specifications on all I-B buckets and grapples, and contains many photographs of this money-making equipment at work.

BROWNHOIST

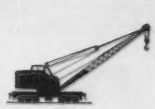
CLAMSHELL BUCKET

250 TON WRECKING CRANE

COAL-ORE BRIDGE



CAR DUMPER

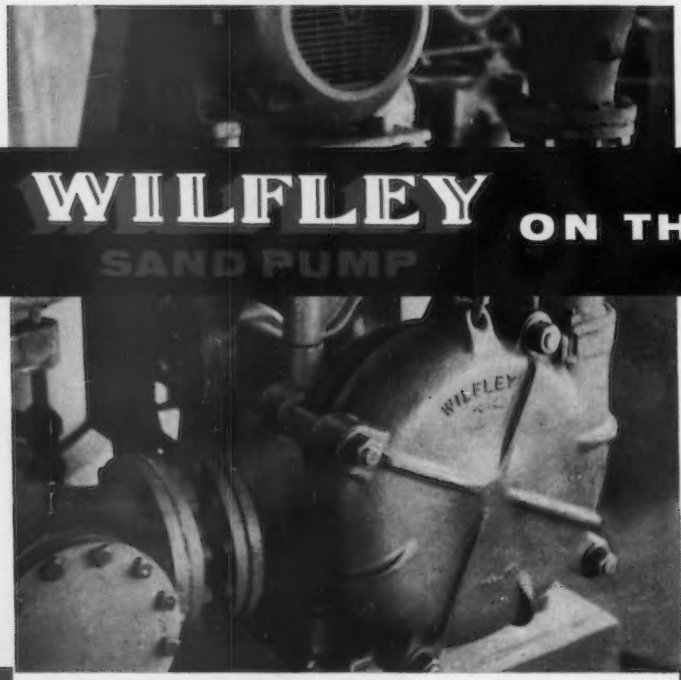


LOCOMOTIVE CRANE

INDUSTRIAL BROWNHOIST CORPORATION, BAY CITY, MICHIGAN • DISTRICT OFFICES: New York, Philadelphia, Cleveland, Chicago, San Francisco, Montreal, Canada • AGENCIES: Detroit, Birmingham, Houston

203

Get HIGHER OUTPUT!
CUT operating costs!



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Only Wilfley gives you all this:

- Maintained high efficiency throughout the life of the pump.
- Quick-change features reduce maintenance costs, minimize downtime.
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- Simple, efficient packingless design and rugged construction assure continuous, trouble-free operation.
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ENGINEERING AND MINING JOURNAL

JULY, 1958

The Role of Industrial Statesmanship

Vice President Nixon's recent unfortunate experiences in Venezuela and Peru revealed a serious breach of understanding between certain segments of the Latin American population and the U.S. While it is clear that these flare-ups are due in part to a persistent Communistic agitation in Central and Latin America, it is equally evident that U.S. overtures to establish good will are not as effective as they should be.

An interesting reaction to the Nixon "reception" was expressed by a Peruvian non-mining industrialist who visited E&MJ's offices in May. When asked what his reaction to the incident was, he replied that there was sincere concern over the incident in Peru, but that he and many of his fellow citizens were shocked when American press reports reached Peru citing proposals to patch up the situation with more dollar aid.

Here, again, we have evidence that the wornout concept of dollar aid is backfiring, not only in Latin America, but in the Middle and Far East as well.

What then constitutes a more potent substitute? Certainly not a counter-barrage of anti-Communistic propaganda.

We feel that the mining industry is evolving and practicing a more acceptable course of action—industrial statesmanship.

Privately and in annual reports, executives of mining companies operating in the international field have expressed certain concepts and aims, which taken together formulate a program far more effective than aid programs. Here are some of these concepts:

1. Training local talent. The old tradition of placing only Europeans or foreign nationals in positions of skill and responsibility is rapidly giving way to extensive training programs which will enable local employees to occupy such positions. In Chile, Peru and Argentina you will see workmen with strictly agrarian backgrounds tearing down, repairing and reassembling diesel engines. This training has literally moved them from the llama to the truck in one generation. Similar programs in the Rhodesian Copperbelt and Belgian Congo have been publicized.

2. Breaking down language barriers. South American mining companies are intensifying programs to train Spanish-speaking employees to learn English and foreign employees to learn Spanish.

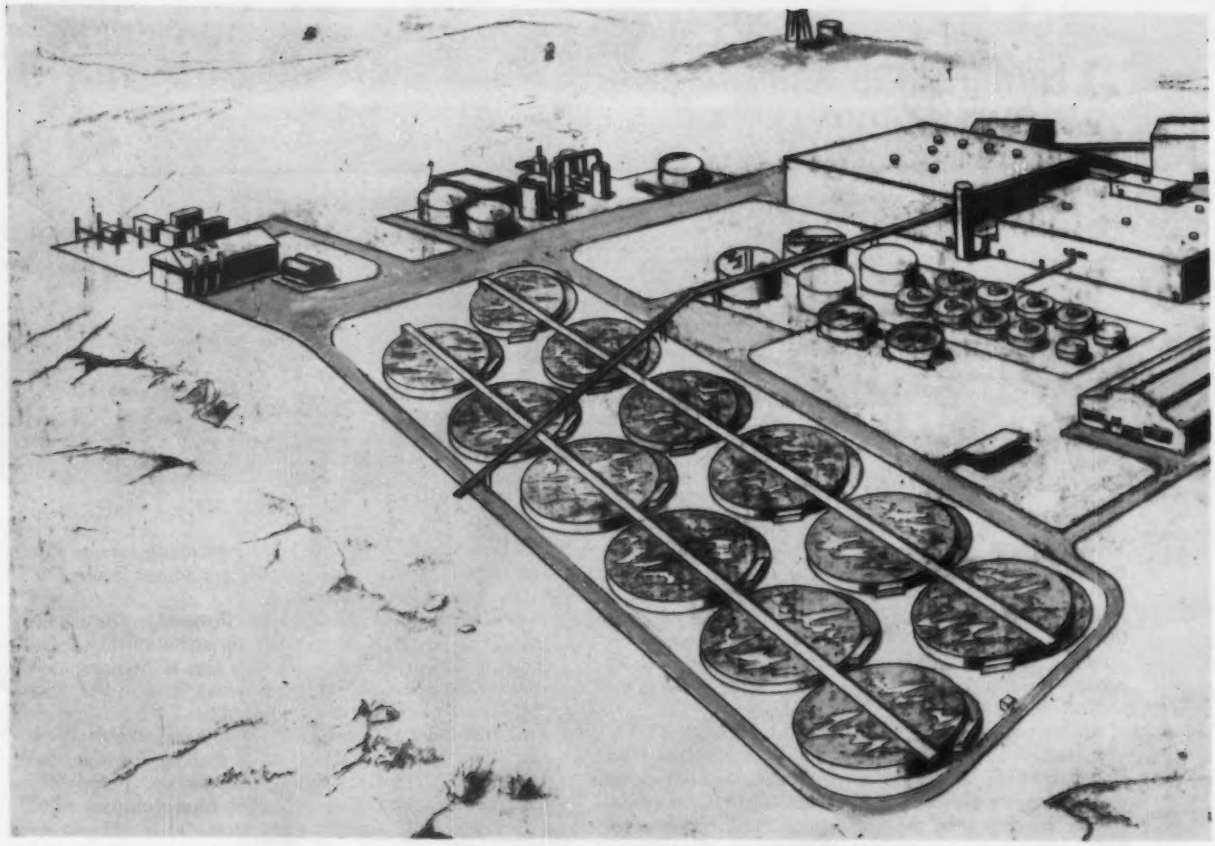
3. Encouraging exchange students. Cerro de Pasco Corp. has awarded postgraduate scholarships to Peruvian engineers for training in the United States. See page 116. Hector Boza, former vice president of Peru, has suggested that U.S. engineers planning foreign service would benefit by taking post-graduate courses in Latin American universities.

4. Exercising good corporate citizenship. The manager of one Latin American mining operation expressed company policy as follows:—"We aim to become good corporate citizens, working under the laws of the land and strictly avoiding national politics."

5. Affirming the real value of mineral wealth. Now that science is on the threshold of melting down granite mountains to produce silica, alumina and potash for food, clothing and shelter, fear of future chronic mineral shortages is diminishing. The world is recognizing that the real value of minerals does not lie in the ground, nor in their selling price in the market place, but in the jobs which mining, milling, smelting and refining afford to local population. Mining companies have demonstrated this permanent and tangible value in the form of townsites, railroads, power networks, schools, hospitals, water sources and food supplies which must be developed in remote places to sustain mining operations. Reynolds Metals Co., in developing bauxite reserves in Jamaica, has expressed its objectives this way—"We aim to leave more on the island than we take out."

6. Diversifying the one-crop nations. This topic does not come directly under the heading of industrial diplomacy because mining companies shun interference with national policies. However, *E&MJ* offers this suggestion to countries deriving principal revenues from single commodities such as metals and oil: since world markets are extremely sensitive to cyclic business fluctuations and react sharply to slight surplus or shortages, we recommend that substantial portions of revenues received from these single commodities be diverted to the establishment of new and diversified industries. For instance, it's not too early for countries on the west coast of South America to develop irrigation programs either with water from the Andes or fresh water derived from the sea, to create a huge agricultural area out of the arid but intensely fertile lowlands that flank the Andes on the West. Diversification of this nature will go far to establish economic and political stability in these areas.

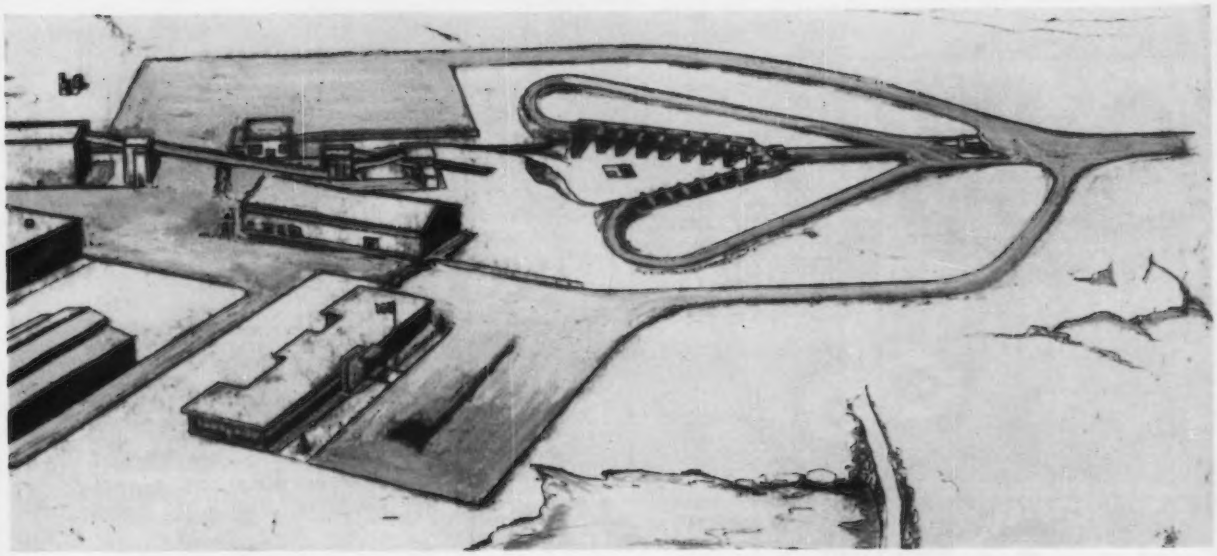
Finally we suggest that international mining companies intensify their programs of industrial statesmanship as well as sound public relations programs which will make these objectives and accomplishments clear to everyone, and to both sides of the Iron Curtain.



CLYDE E. OSBURN is mill manager of Homestake-New Mexico Partners 750-ton, carbonate-leach plant.

ELMER ISERN is vice president of Kermac Nuclear Fuels Corp.'s mining and milling projects in Ambrosia Lake.

GEORGE H. COBB is executive vice president of Kermac Nuclear Fuels Corp. which has four mines in the area.



KERMAC'S 3,300-TON MILL is scheduled for operation before the end of 1958. The ore will be leached with sulphuric acid and then treated by the liquid-liquid solvent extraction process. Drawing by Stearns-Roger.

U_3O_8 Production Now Under Way At Ambrosia Lake District

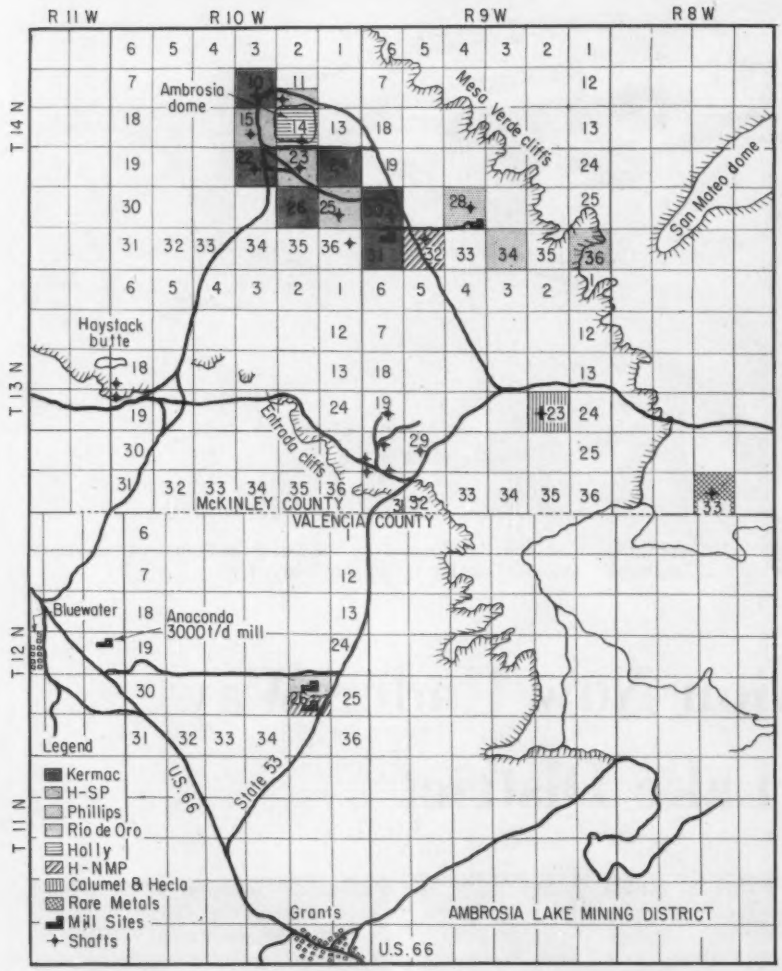
LANGAN W. SWENT is manager for both Homestake-New Mexico Partners, and Homestake-Sapin Partners.

JOHN B. HUTTL

IN BOTH ECONOMIC AND SCIENTIFIC INTEREST, existing uranium mines of the world offer few parallels to the extensive deposits under development at Ambrosia Lake, N. M. The mineralization found here differs in character and deposition from any other uranium orebodies found and worked so far. Operators entering the area after discovery of uranium in 1955 found conditions for which no precedent or textbook exists, and they faced all of the problems of underground mining encountered in a new and unexploited field. As a result, the operators had to develop new techniques and concepts to explore for and open the orebodies which occur at depths ranging from 300 to 1,000 ft, in a water-saturated sandstone known as the Westwater member of the Morrison formation. Principal operators in the field have strong financial backing, and there is no doubt that some of the physical and engineering problems will be solved by the able and experienced men directing the work.

Ambrosia Lake district is in McKinley County in northwestern New Mexico. Largest nearby settlement and headquarters for most of the people employed there is Grants, situated about 25 miles south on U.S. Highway 66 and midway between Albuquerque and Gallup. The town is experiencing all the problems resulting from a booming population increase. The first uranium discovery in the Grants area was made in 1950 by Paddy Martinez, a sheep-herder. It lead to the development of the Haystack Mountain mine 10 miles northwest of Grants by Santa Fe R.R., and the establishment of the large Anaconda mill at Bluewater to process the ore and that from the company's Jackpile mine in Valencia County. Ambrosia Lake uranium was discovered in 1955 by Louis Lothman of Houston, Texas, while drilling an exploratory hole in the district.

Large-scale exploration activities followed soon thereafter. At times there were as many as 50 drill rigs in operation within a radius of five miles. It is estimated that 4-million ft of drilling costing about $5-million has been carried out from 1955 to the present time. This work is being continued, with operators having from two to four rotary drills active in the field. Drilling disclosed large ore reserves which in the main were evaluated by using the gamma-ray log and



EXPENDITURES IN THE AMBROSIA LAKE AREA will total about $81-million, and boost daily domestic uranium milling capacity of the U.S. by 7,000 tons.

PHILLIPS PETROLEUM'S Ann Lee four-compartment shaft is 735 ft deep.

AXIVANE EXHAUST FAN is installed on top of 36-in. hole at Ann Lee mine.

subsequent correlation with cuttings and core samples. At the end of 1957 more than 50-million tons of proven and potential ore averaging 0.30% U_3O_8 had been indicated. However, it is estimated that dilution occurring during mining operations will reduce this figure to about 0.25% U_3O_8.

Ore Occurs in Lenses

All of the known deposits in the Ambrosia Lake area occur in the Westwater Canyon sandstone member of the Morrison formation. The Morrison is divided into three members—namely, (1) Recapture Creek (lower Morrison; (2) Westwater Canyon Sandstone (middle Morrison); and (3) Brushy Basin Shale (upper Morrison). Thickness of the Morrison, which is late Jurassic in age, averages 450 ft, while that of the Westwater varies from 100 to 300 ft. Main mineral trend of the Westwater is NW-SE, and general dip NE. All of the ore deposits are found in areas where the Westwater sandstone section is light gray in color. The orebodies consist of a series of discontinuous lenses of varying thickness lying at different elevations, surrounded by unconsolidated sandstones containing mud or shale partings. In some parts of the area as many as six of these elevations or zones can be recognized, while at other places only one zone is present. In sections where the thickest ore is found, several of these zones have merged forming a single zone as much as 100 ft thick. In general, lenses vary in thickness from a few feet to more than 20 ft. The principal uranium mineral is coffinite. All of the ore found so far is associated with what is locally called black asphaltic residue. The thickness and grade of the ore are roughly proportional to the thickness and amount of asphalt present in the sandstone. Presence of this asphalt indicates that the Ambrosia Lake area is part of an ancient oil field.

Active Companies in the Field

Principal mine operators active in the Ambrosia Lake field today include Homestake-New Mexico Partners; Homestake-Sapin Partners; Kermac Nuclear Fuels Corp.; Phillips Petroleum Co.; Calumet & Hecla, Inc.; Rare Metals Corporation of America; Rio de Oro Uranium Mines, Inc.; Four Corners Exploration Co.; Yucca Mining & Petroleum Co.; Mineral Project Venture B; and others. The accompanying map shows locations of the different company holdings and shaft

HOMESTAKE-SAPIN PARTNERS' Section 23 mine is now under development. When completed, the shaft, which has four compartments, will be 660 ft deep.

KERMAC'S SHAFT at Section 22 mine is 826 ft deep; has three compartments.

MUCKING SOME WET STUFF at Homestake-New Mexico Partners' Section 23 mine. Ore is shipped to 725-ton mill.

RADIOMETRIC PROBING of a test hole at same mine. Bob Schirmer, on ladder; Ted Rizzi, geologist, takes notes.

and mill sites. To bring the mines and projected mills into production, the companies have already invested more than $21-million and another $60-million will be required before the planned 7000-tpd production is reached. The mines and mill sites are accessible via a network of graveled roads, with a main branch connecting with State Highway 53 recently paved for a distance of 22 miles. This highway links San Mateo, N. M. with U. S. Highway 66 at a point four miles west of Grants.

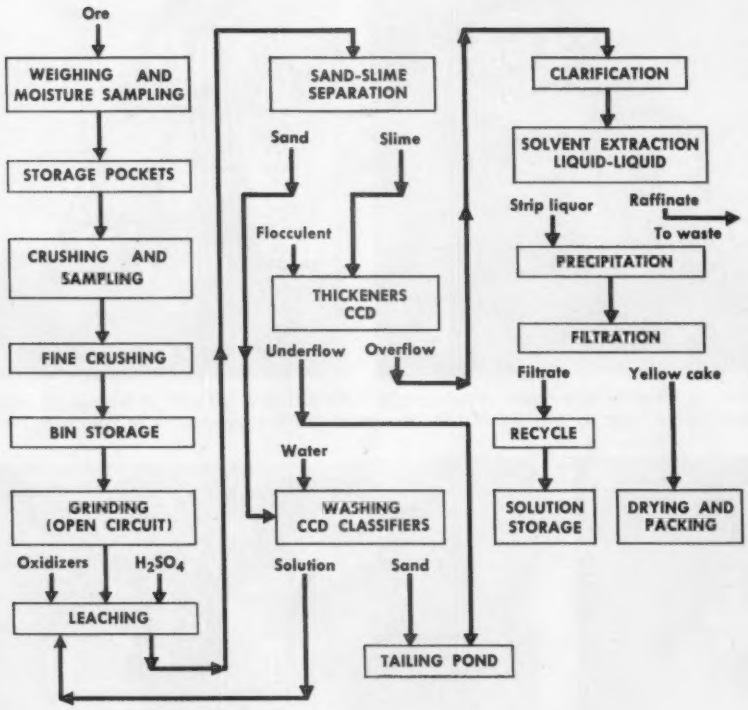
Shafts and More Shafts

At the time of *E&MJ's* visit to Ambrosia Lake late in March, 12 major shafts were being sunk, several already completed, and work on five more scheduled to start soon. Most of them are lined with steel sets. Sinking operations were expedited by use of mechanical shaft muckers. Surface plant structures include heavy steel headframes, modern hoisting equipment, compressor room, change room, warehouse and office. Electric power is generated either by mobile or stationary dual-fuel units operated at central points with short powerlines extended to neighboring mines under the same ownership. Considerable attention is being paid by the operators to ventilation. To utilize the main ventilation system as soon as possible, several companies have drilled large diameter holes from the surface ahead of development. These contain a steel casing 36 in. in diameter. The exhaust fan mounted over the hole in some instances is a Joy 125-hp Axivane unit.

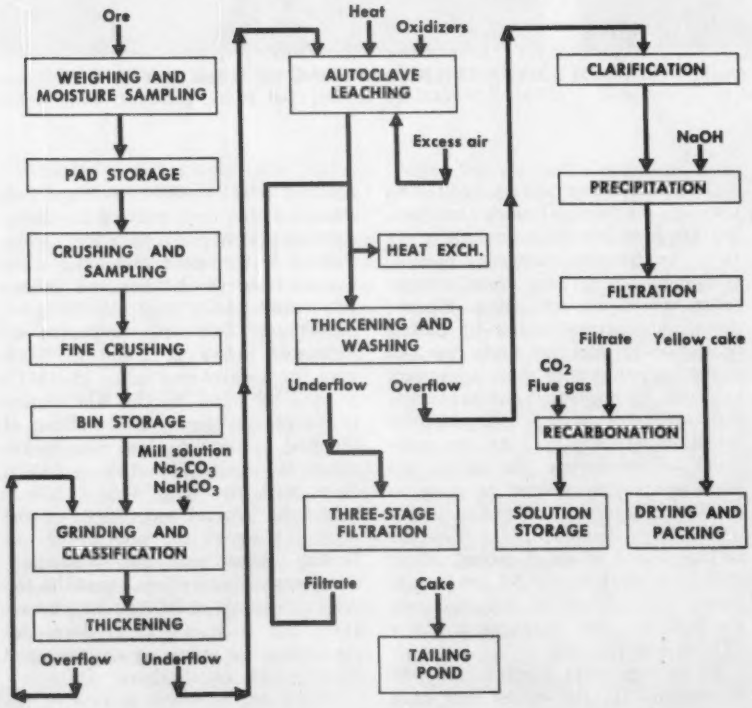
No serious water problem has been encountered in the mines that have reached the production stage, although in the early part of the development period predictions for the inflow of water into a developed mine ranged from several hundred gallons per minute to a high 45,000 gpm. Subsequent field tests indicated an estimated inflow at 2,000 to 5,000 gpm for a developed mine. H-NMP's Section 32 mine, in the wet section of the general mining area and one of the first to produce ore, now makes about 500 gpm. The shaft is 651 ft deep, with the sump almost 200 ft below the general water table of the district lying at the contact of the Brushy Basin and the Westwater. Similar water conditions prevail in the Ann Lee mine of Phillips Petroleum. Here, the shaft is 735 ft deep. All companies are providing adequate and heavy pump installations.

In the northernmost section of the

HOMESTAKE-SAPIN PARTNERS FLOWSHEET
CARBONATE LEACH, CAUSTIC PRECIPITATION



KERMAC NUCLEAR FUELS CORP. FLOWSHEET
LIQUID-LIQUID, SOLVENT-EXTRACTION PROCESS



mining area where the Westwater rising is above the general water table, established mines are dry. These include Section mines 10, 11, and 14. Section mine 15 is both dry and wet. Mines in Sections 22, 23, 24, 25, 26, 28, 30, and 32, lying in the area where the Westwater drops below the general water level, are wet.

Water is less of a problem as is the mucking and haulage of broken ore. The ore in which the uranium is associated with an asphalt of a specific gravity close to "1," is easily broken to sand grain size. Any water washing over the broken material tends to carry portions of the asphalt with it, causing excess wear on pumps and frequent cleaning of sumps.

Ground conditions encountered so far have been better than expected. Relatively little timbering is required for drifts less than eight ft wide. However, full timbering is needed in one mine where drifts are advanced with 14-ft widths. Ore mucked, hauled to the shaft loading pocket, and hoisted to the surface is nearly 85% sand grain size and contains from 15 to 20% moisture. The ground is easily drilled and blasted. Costs covering both operations are low.

New Equipment Needed

None of the operators has yet decided on a definite mining method. All are studying the problem with great care, and all are aware that new types of loading and haulage equipment and transportation systems will have to be developed to meet existing underground conditions. Mining methods under study and actual test in some properties include room-and-pillar with trackless mining and haulage equipment, and room-and-pillar with basic track haulage below the ore zones. In the latter system, the ore zone will be entered first by raises, followed by establishment of sublevels with slushers. Any water encountered in the working areas will flow by gravity to the main haulage level below.

Here is a short roundup of what was going on at the different mines visited in late March.

Homestake-New Mexico Partners. L. W. Swent, manager; R. J. Stoehr, mine superintendent; T. M. Rizzi, chief geologist; and C. E. Osburn, mill manager. The mine now nearing the production stage is in Section 32. It is perhaps the farthest advanced, both in development and experimental mining of ore, in the wet area. The shaft is equipped with a Vulcan double-drum hoist and contains three compartments. Depth is 651 ft, main haulage level is at 595 ft and the

shaft sump nearly 200 ft below the general water table. Thickness of ore lenses available for mining varies from 3 to 14 ft. Development work done up to March totalled 6,000 ft and current monthly advance averages 1,300 ft. All ore obtained from development work is trucked to the company's new mill designed for carbonate leaching followed by caustic precipitation. Drilling is done with Jacklegs and blasting with semi-gelatin powders. Mining method planned is room-and-pillar, with raises and slusher sublevels between the ore zones and main level. The mine makes about 500 gpm water. This is handled by two 500-gpm centrifugal pumps (one standby). At the present time, Homestake Exploration, Inc., a subsidiary of Homestake Mining Co. has four rotary drills operated by a contractor doing exploration work.

HOMESTAKE-SAPIN PARTNERS' 1,500-ton carbonate-leach mill is nearing completion on north half of Section 26. Contractor is Utah Construction Co.

PHILLIPS PETROLEUM CO.'S 1,725-ton carbonate-leach uranium-extraction mill was erected in Section 28. Contractor is Western-Knapp Engineering Co.

Homestake-Sapin Partners. L. W. Swent, manager; D. T. Delicate, mine superintendent; and E. S. Allen, mill manager. The company is developing three mines in Sections 25, 23, and 15.

The Section 25 mine is opened by a four-compartment shaft 811 ft deep, with a main haulage level being advanced at 745 ft. On this level a pump station containing two 1,200-gpm centrifugal pumps (space available for two additional units) has recently been installed. Ore widths encountered vary from 3 to 30 ft. The mining method planned will follow closely that to be used in the H-NMP Section 32 mine. Surface plant equipment consists of a 150-hp Nordberg double-drum hoist, two 1,650-cfm compressor units, change house, warehouse and office. Electric power is obtained from the central generating plant at Section 23 mine.

At the Section 23 mine the company's own crew is sinking a four-compartment shaft similar in size and layout of compartments as that at Section 25 mine. At the time of visit, the shaft had passed the 660-ft mark, and a level station was being cut at 650 ft. Average sinking advance per 24 hr is eight ft, with the shaft making about 170 gpm water. Water is handled by three submersibles operating in the sump area and pumping to the sump at the 508-ft pump station. From here, two 1,000-gpm centrifugal pumps transfer it to the surface. Hoist equipment serving the shaft is a 300-hp W-S-M unit. The central power generating plant containing three G.M. 1,000-kw dual-fuel generators furnished electric power to the mine, as well as to the mines in Sections 25 and 15.

The shaft at Section 15 mine is 622 ft deep. It has three compartments and is served by a 100-hp ac double-drum hoist. The main haulage level is at 536 ft and a slusher loading pocket with slusher trench at 563 ft. Lateral work is in progress off the new shaft station. The mine is dry, permitting use of trackless loading and haulage units in development work. The front end loaders and Getman CD48-ton trucks are all diesel powered. Compressed air is obtained from plant operated at the Section 23 mine via an underground 6-in. pipeline. A 32-in. I.D. cased borehole for emergency exit and ventilation has just been completed.

Rio de Oro Uranium Mines, Inc. W. Rodney De Villiers, president, and Ray Schultze, superintendent. The Dysart mine on the southern half of Section 11 was the first to be developed and equipped for production in the district. Current production averages 700 tpd. The ore is trucked to the H-NMP mill about 20 miles south for processing. Mine development consists of a three-compartment shaft 400 ft deep served by a double-drum Vulcan Denver hoist. The ore zone lies at a depth of 360 ft. Blocked-out sections of ore are mined by room-and-pillar method, with drilling done with Jacklegs, loading with crawler-mounted front end loaders, and hauling with Getman CD4 8-ton trucks. All loading and truck units are diesel powered. Average haulage distance is 700 ft. Installation of a belt conveyor is being considered when development of the East orebody has been completed. The mine makes little or no water. Mechanical ventilation for underground workings is furnished by a 70,000-cfm fan via 20- and 24-in. galvanized-iron vent pipes. A novel feature seen in the main haulage drifts are 4-in. aluminum air lines with lightweight Victaulic couplings. Branch lines leading to the headings are conventional steel pipe.

South of the Dysart mine Holly Uranium is mining a small orebody. Mine development consists of a two-compartment shaft 370 ft deep on Section 14.

Kermac Nuclear Fuels Corp. George H. Cobb, executive vice president, Elmer Isern, vice president of mining and milling operations, and Richard Moe, manager of mines. The company

has one mine in production and three under development. Plans are maturing to sink shafts on Sections 17, 33, and 35.

Section 10 mine is in production. Here, the ore zones lie above the general water table, and as a consequence the mine makes little or no water. The orebody developed and available for exploitation is relatively small, its life expectancy being estimated at about 1½ yr. Mine development consists of a three-compartment shaft 520 ft deep, with the main level at 460 ft. Mining method employed is room-and-pillar. Drilling is done with Jacklegs, and loading and haulage equipment consists of diesel-powered front end loaders and Getman CD45-ton trucks. Monthly production of ore and waste averages about 10,000 tons.

Section 22 mine is under development, with a three-compartment shaft being sunk to 826 ft. Levels will be established at 630, 680, and 730 ft. The shaft is served by a 400-hp Coeur d'Alene double-drum hoist. A Joy WN-12,950-cfm compressor furnishes air for underground operations. Electric power is obtained from the central power station at the mill site on Section 23. Generating equipment consists of three 1,000-kw, dual-fuel G.M. generators. The company is now completing a 115,000-v power line to bring in electric power from the Public Service Co.'s plant in Albuquerque. Two-thirds of the cost will be assumed by the company and the remaining third by Phillips Petroleum.

At the Section 24 mine, a five-compartment shaft is being sunk by a contractor to the 80-ft horizon. The 300-ft mark had been passed late in March. A level will be established at 675 ft. Permanent hoisting equipment will comprise a 40-hp Coeur d'Alene double-drum hoist and a 400-hp Colorado Iron Works single-drum unit. Compressed air is generated by two 900-cfm compressors. Electric power is obtained from the power plant at the mill site mentioned.

Section 30 mine. Here another five-compartment shaft is being sunk by a contractor to a depth of 760 ft. Late in March the 600-ft mark had been passed. This shaft will serve a large concentration of ore. Levels will be driven at the 502, 552, and 685-ft horizons. The air, power, and hoisting systems duplicate those at the Section 24 mine.

Phillips Petroleum Co. A. A. Ruoho is general superintendent, Ray Jenkins, superintendent of mines, and Roger Caywood, mining engineer.

The Ann Lee mine, which contains a large concentration of ore, has reached the production stage. It is on Section 28. Mine development consists of a four-compartment shaft 735 ft deep and a main level at 660 ft. Hoists used include a 300-hp Nordberg single-drum unit and a 350-hp single-drum Vulcan unit. Developed ore will be mined by room-and-pillar method, with room dimensions held to 80x80 ft. Mining equipment available underground comprises a Joy loader, Getman CD4 8-ton trucks, and a crawler-mounted, single-jib drill jumbo. At the main shaft stations are slusher troughs into which haulage trucks dump their ore loads. From here slushers transfer the material to the measuring pocket below. A large pumping station and a permanent power station are now being installed on the 660-ft level a short distance from the shaft. On the surface, near the shaft, is a 36-in. cased borehole equipped with a 125-hp Joy Axivane exhaust fan. Compressed air is generated by three 600-cfm C-P portable compressors. Two 950-kw diesel-electric Baldwin generating sets furnish electric power. These will be available for standby work when the power line from Albuquerque mentioned before has been completed. The company has recently let contracts for sinking two 12-ft circular, concrete-lined shafts, one at the Cliffride mine and the other on the Sandstone mine.

Calumet & Hecla, Inc. George McKereghan, manager, and Randall Weege, geologist-engineer.

A contractor has recently completed a 2,000-ft, 10-deg incline shaft at the company's Marquez mine on Section 23 to develop and exploit a large orebody outlined by previous drilling. The shaft measures 9x13 ft in cross section inside the timbers, providing ample room for truck haulage. Surface plant structures at the mine include a large building housing the office, change room, warehouse and repair shop; a powerhouse containing two Caterpillar D337 generators; and compressor station with two 800-cfm Joy compressors. All buildings are of pre-fabricated steel construction.

Rare Metals, Corp. of America. C. L. Perkins, president; M. H. Kline, vice president and assistant general manager; and A. A. McKinneym superintendent, Southwest Division.

A contractor is now sinking a shaft on the company holdings to develop a large orebody lying about 1,000 ft below the surface.

Four Mills Being Built

The four large processing plants under construction in the area since 1957 are the 750-ton mill of H-NMP on the south half of Section 26; the 1,500-ton mill of H-SP on the north half of Section 26; 1,725-ton mill of Phillips Petroleum on Section 28; and the 3,300-ton Kermac mill on Section 31. The H-NMP mill went into operation on February 5, 1958, with the yellow cake being weighed and barreled on March 5. H-SP and Phillips expect their plants to be completed by July, and the Kermac mill is scheduled to be in operation before end of 1958.

10,275 tpd to Come

When all mills are in operation, and with the 3,000-ton Anaconda plant at Bluewater, N. M., there will be available in the district a total milling capacity of 10,275 tons per day. Of this figure, 5,550 tons will be processed by acid leaching methods and 4,725 tons by carbonate leaching methods. About 1,100 tons of the total capacity will be available to independent producers—500 tons in acid mills and 650 tons in carbonate mills.

Operations carried out in the 750-ton, H-NMP mill after crushing and sampling include closed circuit grinding with solution to 65-mesh in a ball mill-spiral classifier unit; thickening of classifier overflow to 50% solids; leaching thickened pulp in hot (180 deg F) solutions with excess air for 36 hr in Pachuca tanks; dilution and washing the leached pulp in one stage of thickening; thickened pulp (50% solids) filtration and washing on drum-type vacuum filters; second stage of drum-type filtering to further wash pulp; pumping washed tailings to pond; clarifying pregnant solution; yellow cake precipitation from pregnant solution with an excess of caustic soda; yellow precipitate filtration in pressure filters; yellow cake drying in a multiple-hearth drier and packing in drums for shipment; barren solution recarbonation in cypress packed towers using boiler house flue gases as source of CO_2; and return of recarbonated solution to leach circuit or mill solution storage.

Save for leaching the ground ore under pressure at temperatures up to 275 deg F in autoclaves equipped with mechanical agitators and drying the yellow cake with steam in a Proctor-Schwartz drier, treatment at the H-SP mill under construction will follow closely that practiced at the H-NMP plant. The Phillips mill, also designed for carbonate leaching followed by caustic precipitation to produce a specification grade yellow cake, will use Pachuca tanks with pressure heads in the leaching section. Unlike the other three mills mentioned, the Kermac plant will use sulphuric acid leaching with liquid-to-liquid solvent extraction similar to the methods employed at Kerr-McGee's Shiprock, N. M., mill.

It May Pay to Check Past Percentage Depletion Calculations

FRANK H. MADISON

CONGRESS, in the U.S. Internal Revenue Codes of 1939 and 1954, has defined "gross income from the property" for the purpose of computing percentage depletion, as being the "gross income from mining" and including "not merely the extraction of the ores or minerals from the ground but also the ordinary treatment processes normally applied by mine owners or operators in order to obtain the commercially marketable mineral product or products. Ordinary treatment processes are defined in Code Section 613 of the Revenue Act of 1954.

The Internal Revenue Service, in construing this definition, has consistently held that "ordinary treatment processes" are those processes which concentrate the ores for shipment. However, taxpayers in the industrial minerals field have felt that the ordinary concentration processes do not cover their particular processes and that they were entitled to more "gross income" based upon the selling price of the finished material. The brick and tile industry and the cement industry have carried their claims to various courts and have consistently obtained adverse rulings to the Commissioner of Internal Revenue's regulations, regarding what constitutes "gross income from the property".

For example, the Internal Revenue Service, in the brick and tile industry stopped the mining processes at the pug-mill and computed gross income on an allocated basis from sales of the finished product. The courts have rejected this method and, in the case of U.S. vs Cherokee Brick & Tile Co., the Court's opinion was partially as follows:

"It is this Court's opinion that the "first commercially marketable product" was used because at no earlier stage would it be possible to determine just what would be the gross income from mining—the Court can only conclude that under the statute gross income from mining is the selling price of the finished brick and tile, f.o.b. plant, loaded for shipment."

The Court decision in U.S. vs Cherokee Brick & Tile Co., has been quoted with approval in at least 22 other cases of brick and tile manufacturers, in at least three refractory and fire clay cases, in two talc cases, and in several other cases such as that of the Dragon Cement Co.

In the Dragon Cement case, the Commissioner had allowed as mining the processes up to the start of the clinker stage and held the balance of the processes were manufacturing and therefore not depletable. The First Circuit Court reversed this line of reasoning and allowed the sale of cement in bags as "gross income from the property." It stated that "depletion is not an allowance upon any process, mining or manufacturing, or upon any product, but rather it is an allowance to diminish taxable income from exploitation of a natural resource."

The United States Government appealed to the Supreme Court for a "writ of certiorari" to review the judgment of the United States Court of Appeals for the Fifth Circuit in the case of Merry Brothers Brick & Tile Co., et al.; and also for a "writ of certiorari" to review the judgment of the Court of Appeals for the First Circuit in the Dragon Cement case.

The Supreme Court of the United States, in its October 1957 term, denied the request for a "writ of certiorari" in the brick and tile cases and the Dragon Cement case, thus leaving the problem of computation of "gross income from the property" as being based upon the sale of the finished product in accord with the various Circuit Court decisions.

In other cases, the Courts have held that pulverization, packaging, bagging and furnacing are parts of the ordinary processes of mining and should be included in "gross income".

In a decision handed down on April 14, 1958, (Monolith Portland Cement Co. vs U.S., United States District Court, Southern District of California) the Court held with Dragon in allowing 10% of gross sales of manufactured cement but refused to allow gross sales to include expenses such as royalties, trade discounts, trucking, rail freight, warehouse and bulk storage plant costs at distribution points away from the taxpayer's cement plant, additional expense for sales in bags, cost of bags, and cost of bagging the cement.

These decisions are, without question, equally applicable to the various other products of mines and mills.

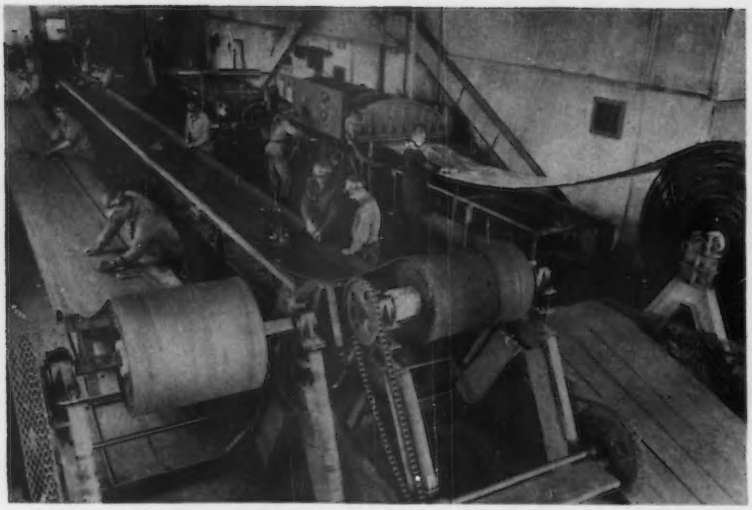
The Internal Revenue Service, in addition to the above expenses, is maintaining that the cost of additives, such as gypsum, iron, etc., should also be excluded in the computation of "gross income from the property". Whether or not this is in conflict with the announcement of the Service made on page 51 of the I.R.S. Bulletin No. 1957-43-Oct. 28, 1957, regarding depletion allowances on brick and tile clay and cement rock is problematical. The announcement is quoted:

"In view of the denial by the Supreme Court of the United States on October 14, 1957, of the Government's petitions for certiorari in United States vs Merry Brothers Brick & Tile Co., et al., 242 Fed. (2) 708 (1957), and in Dragon Cement Co., Inc., vs U.S. 244 Fed. (2) 513 (1957), the Internal Revenue Service is taking steps to dispose of pending litigations and claims involving brick and tile clay and cement rock, as required under these decisions, and to conform Treasury regulations and outstanding rulings accordingly. This should permit the expeditious disposition of the great majority of such cases. Consideration is being given as to the applicability of these decisions in cases involving fire clay and limestone."

The Treasury has estimated that the Court rulings on brick and tile clays and the cement industry will cost the Government $50-million a year in lost revenues. It has requested Congress to draft legislation relating to the cut-off point for computing percentage depletion for the clay and cement industries. (Treasury letter to House Ways and Means Committee, dated April 24, 1957, released April 25 by Chairman Wilbur D. Mills of the Committee.) It is highly probable that, if the Committee were to incorporate the Treasury recommendation into law, it would be prospective only and not retroactive.

It would appear, therefore, that each mineral producer should reexamine its percentage depletion claims as regards "gross income" in the light of these Court decisions and if it finds itself within the purview of these decisions, should take steps to safeguard its interests. Presumably overpayment of taxes in past years may be recaptured if claims are made within the statutory limitation period.

Mr. Madison is a member of the consulting firm Behre Dolbear & Co., New York, N.Y.



WORKMEN STRIP AWAY top cover of belt so that new ply material can be applied at the plant of Conveyor Belt Service, Inc. The belt on the right has been repaired and a portion of it is passing through a vulcanizing-curing machine.

AUSTIN GANGLE, CBS plant manager, left, and W. A. Mars, company president, inspect 60-in. belt to be repaired. See text.

New Life for Damaged Conveyor Belts

A BADLY DAMAGED CONVEYOR BELT is a serious and costly problem, but one which operators may have to face because of the many hazards which beset conveyor belt operation. Five years ago the only solution for such a problem would have been the purchase of a new belt. But now, because of a new repair process which has been developed, many damaged belts can be restored to useful service.

The idea of restoring damaged belts occurred to William A. Mars, an industrial supply distributor in Duluth, Minn., nearly ten years ago. He observed that thousands of feet of belt were being scrapped before they were worn out. After five years of research and study, he developed an operation designed to repair conveyor belts on a continuous basis, and organized Conveyor Belt Service, Inc.

Many problems had to be overcome in developing this service. A press had to be designed to handle continuous belt repair. This was done by modifying the conventional vulcanizing platen press. Moisture in a belt transforms into steam in the vulcanizing press and can cause rips in the cover stock of a belt if the steam pressure becomes high enough to create a "blow-out". Hence, moisture control presented Mars' firm with its first technical problem in pressure and temperature control.

Repair materials required attention. Bonding cements had to be developed, and various ply and cover stocks had to be chosen with care.

The first belt to be repaired by the company was a damaged belt from a Mesabi open pit mine. Replacement would have cost $15,000. This repair job cost $6,000, and the belt is still running in good condition after hauling more than 8-million tons since repair.

The largest job completed involved the repair of 6,000 ft of belting for a Mesabi Range crushing plant. In this case, practically all of the belting was repaired in the crushing plant for a great saving in downtime.

If a belt cannot be spliced or repaired at the mine, it is shipped to the CBS plant in Virginia, Minn. Here the belt is dried at 230 deg F, then examined for flaws or weakness. Where necessary, the cover is stripped away, and damaged ply material is removed. New ply is cemented in place, and the top coat and a special breaker strip are laid over the ply. The same process is carried out on the bottom of the belt.

The belt is then fed to a modified vulcanizing platen press which vulcanizes new rubber materials at carefully controlled curing temperatures and pressures.

Toughest repair job handled has been a 60-in., steel-cable-reinforced belt to move crushed taconite. More than 400 ft of this belt had been sliced through by a hidden piece of tramp iron. The 30,000-lb belt was difficult to handle. However it was restored to useful service. This experience demonstrated that if the carcass of a belt is sound, any type or size of belt can be repaired.

Causes of Belt Damage

Damage to conveyor belts may be accidental or due to severe wear and tear.

These are some of the accidental causes of damage:

1. Edge tears caused by belt running off the conveyor and into the structure.

2. Rips which are caused by foreign material caught in the belting.

3. Damage caused when material builds up on the pulleys.

4. Misalignment of a spline which prevents the belt from training properly.

5. Damage caused when the drive pulley slips.

6. Damage caused when material jams in the chute.

Damage caused by severe wear and tear under normal operating conditions includes:

1. Top cover cuts and gouges caused by severe loading conditions.

2. Skirtboard wear caused when skirts are allowed to ride too close to the belt.

3. Damage caused by materials trapped between belt and pulley.

4. Excessive lubrication of idlers.

5. Excessive cover wear caused by abrasive materials.

6. Hardening and cracking of the cover caused by moving hot material on the belt.

KAWA TRIBESMEN, dark, wild and unconquered presented the author and his military escort with a get-out-fast ultimatum consisting of a red pepper, piece of charcoal and a feather wrapped on a notched stick with bark string. Pepper symbolizes anger and hostility; charcoal—death and destruction; bird feathers—promising quick action if the warning is ignored. Each notch in the stick represented one village. Bearers of the message gave names of some of the large villages which would send warriors. Illustration above is an accurate reproduction of the Kawas serving notice, based upon a photograph taken by the author during the trip to the Kawa area to examine mineral occurrences during 1920. Highlights of the trip, excerpts of a trip report, maps, and an intriguing boundary dispute which relates to the events reported, are included in this article by Mr. Searls, chairman of the board of directors of Newmont Mining Corp.

The Wild Wa's

FRED SEARLS JR.

IN MAY 1952, the editors of *Economic Geology*[1] were indulgent enough to publish an article by the writer, entitled "Karst Ore in Yunnan." This article described the method of occurrence of certain ores in limestone in the area of the Burmese-Chinese boundary west of Puer Fu, at about 23° North latitude, but only alluded to the political situation of the area.

It has been suggested by colleagues that in view of the great age and early retirement of the writer, these further details be made of record. They were once proffered to the Department of State of this great nation as further evidence of the antiquity of colonialism, but this was prior to General Marshall's determination of the kindly quality of Chinese Communists.

This article recounts the defeat and flight in 1921 of what may well have been the last military expedition in which the arquebus and crossbow were the principal armament of the invading troops! Apologies are offered for absence of photographs showing this weaponry. The writer had, of course, intended to take such pictures. However, the Lo Hu "soldiers" so armed, all ran away when the ultimatum of the Kawas was presented in camp the morning after reaching the Mu Nai objective. They took their weapons with them.

It is improbable that any progress has been made since 1921 in development of the mines mentioned. The Lo Hus, Lisos, Shans, and Was have never been miners; whereas the Chinese in the Ming Dynasty had methods of mining, milling and smelting not unlike some of those described in *De Re Metallica* in a not very different time. The writer was, in fact, until recently in posession of a copy of *Tien Nan Kwang Tchang Tou Lio* (which is a history and account of mining in Yunnan, abundantly illustrated with woodcuts). Unfortunately, this was sent back to China at the insistence of C.Y. Wang, a pre-Communist teacher in the Peking University, who hoped to get it translated. Undoubtedly, it and Wang are both gone.

It would appear from much later records that the dispute which triggered the Yunnan Rebellion, nearly contemporaneous with our Civil War (and overlapping the Tai Ping Rebellion), was actually an extra-lateral dispute between the Mohammedan miners, who had followed a vein down dip from its apex to encounter workings being carried on in the same orebody by Buddhist miners, who had driven an adit to their work. Casualties in the Yunnan Rebellion were several times those of our Civil War. Though perhaps small com-

The noun "Wa" is used interchangeably with Kawa to designate the unconquered, wild, dusky tribes living within the Area "A" showing on maps in this article. The photo-silhouette at right was taken in Mr. Searls' office recently. It shows all that remains today of the notched-stick ultimatum that was served upon Mr. Searls and his associates when they entered the wild Kawa country in 1920.

[1] *Economic Geology*, Vol. 47, No. 3, May 1952.

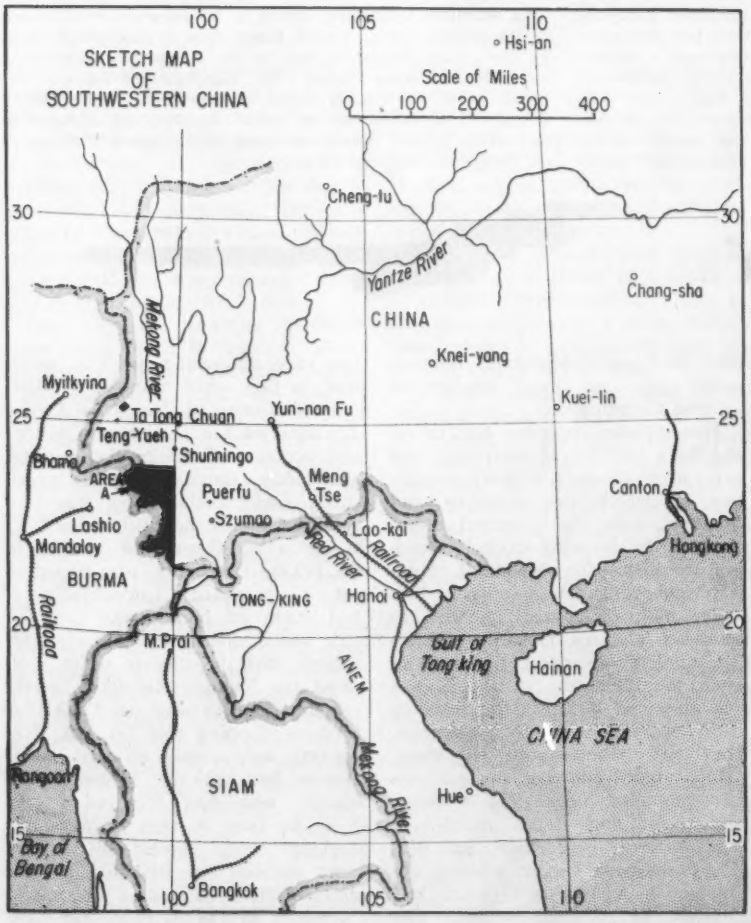
RUGGED LAND OF THE KAWAS as photographed by the author shows faulted and uplifted thick blocks of limestone carved

pared with Communist slaughters, or those of the Mongol Khans, the massacre following the final fall of Tali Fu alone involved several hundred thousand men, women and children. Section 2322 of our revised statutes has been, by comparison, in the interests of peace.

No one wishes to read a travelogue; so I offer merely a map and some photographs, one of which was published in the scientific article above mentioned, plus a translation of the history of the boundary dispute between China and Burma during the last 20 years of the 19th century. To correlate these, however, requires something and there follows an excerpt of the report of the writer addressed in June 1921, to the:

雲南明興礦務有限公司
YUNNAN MING HSING MINING COMPANY, LTD.
YUNNANFU, YUNNAN.

The writer was accompanied from Yunnanfu by Li Tao Ki, a young Chinese engineer now vice president of Wah Chang, and met Messrs. Clark and Gannett, employees of the above company at Lan Tsan Hsien.



AREA "A" marks the destination of the author who was sent out to examine lead-silver occurrences for the Yunnan-Ming Hsing Mining Co. in 1920.

"Ore Deposits in Southwestern Yunnan"

"The writer was engaged by Mr. John W. Finch, in December 1920, to make examination in an area of approximately 5,900 sq miles, in southwestern Yunnan. This is Area A in which you hold a special concession from the Yunnan provincial government for the prospecting and mining rights. Its approximate location in China is shown on the sketch map No. 1. (See accompanying sketch map.) It is bounded on the north by the twenty-fourth parallel, on the east by the one-hundredth meridian East, and on the west and south by the international boundary with Burma. This boundary is unsettled and as its position is important, as determining the possible future value of the area, the history of the dispute will be discussed fully hereinafter.

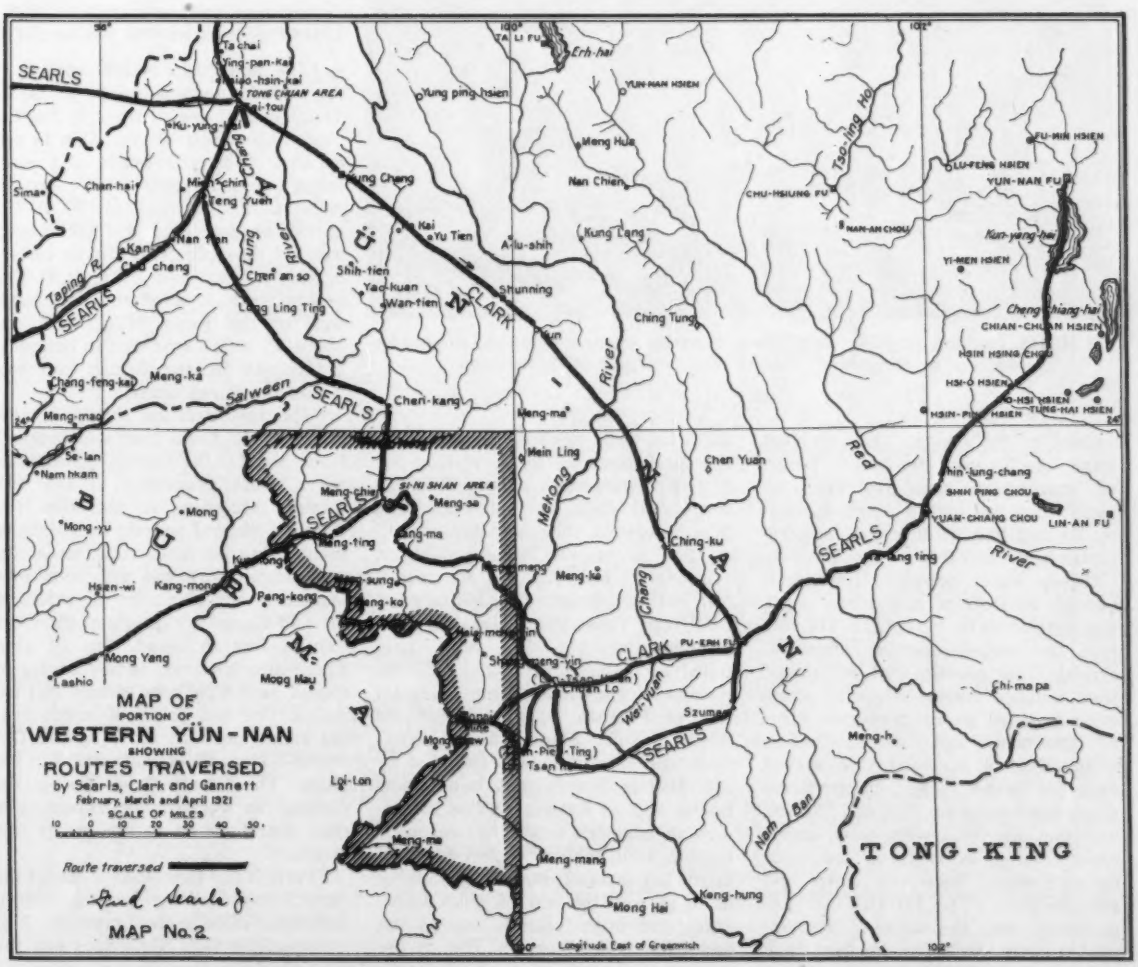
"The main objective of this expedition was the examination of the Mu Nai mine, in this area, near the Burma border. Two prior expeditions had undertaken to make examination in Area A. One failed to penetrate far into it because of the advent of the rainy season, the other never left Lashio. Each of these expeditions returned reports tending to indicate that an important silver-lead mine, comparable to the Bawdwin property, existed in this area, and had

by erosion and solution. Solution of limestone has produced a typical sink-hole or karst topography in this locality.

been extensively worked in the past by the Chinese. Mr. Mills states in his report that in respect to the size of slag dumps and reputation amongst the Chinese, the Mu Nai property ranked ahead of Bawdwin. The writer might say, in advance, that his information acquired later from the same source contradicts this statement.

"The writer is able to subscribe fully to the accuracy of his own conclusions, but feels that the examination was hurried and the above account not very detailed or complete, when the effort required to reach this mine is taken into consideration.

"In explanation of this it should be stated that the mine lies at the border of and partially within the area claimed and controlled by the Kawas. These people who are very savage and hostile to foreigners, were in some way apprised of our



FAILURE OF THE BRITISH AND CHINESE to conquer the tribes within Area "A," shown here in greater detail, resulted in a boundary dispute lasting more than 20 yr. Details of the dispute are related in a translated document, pp 100-102.

MILITARY ESCORT which accompanied the author into the land of the Kawas included a few Chinese soldiers, and natives armed with crossbows and arquebuses. The latter "defected" when the hostile Kawas showed up.

LO HUHS, smelting old Ming slags. These primitive smelters were used to produce lead pigs in foreground. Galena float is abundant in the area.

arrival in the region. They, in fact, knew of the visit two weeks before we reached the area, had been advised that we had a large Chinese escort and had made elaborate preparations to defeat the expedition.

"They were, however, considerate enough to send us a warning which was carried to us by two Lo Hu runners the second morning after our arrival. This consisted of a bamboo stick notched on the edges to which were fastened a red pepper, a piece of charcoal and some feathers wrapped in a leaf and tied with a fibre of straw. The interpretation given this by the Lo Hus and Chinese was that the Was were very angry, were coming as swift as the birds fly and would burn our camp and kill the party. The Lo Hus left immediately and the warning was regarded very seriously by Hsu Kai Yu and the ten Chinese soldiers with us began immediate preparations for departure. By working that afternoon and the next morning we collected the data above set forth, verified our first impressions and at noon followed our escort back to Lan Tsan. The Was advanced the next day.

"The party was accompanied on this trip by Hsu Kai Yu, the magistrate of this hsien. The military escort from Yunnanfu, which had been promised by Mr. Wu Shih Seng failed to materialize, as did also the promised assistance from General Ma, of Puerhfu, commander of the third district. Under these conditions, the expedition was regarded by Mr. Hsu as a very uncertain undertaking and as he was unable to furnish an adequate escort by reason of trouble with robbers within his own hsien he insisted on accompanying us in person. He was of great assistance, and indeed stands out as the one Chinese in Yunnan, not in the employ of the company, who honestly tried to help us.

"Information was acquired establishing quite certainly the existence of another silver-lead mine in limestone in the Meng Ko district within territory nominally Chinese, but well within the area controlled by the Kawas. This has in the past been worked somewhat extensively by the Chinese and the silver values are good. Information concerning it does not point to a very extensive deposit, but we would have been glad to investigate it, were it possible to do so. To have reached it would have entailed a fight in which, in my judgment, any number of Chinese soldiers less than a thousand would be defeated. We could obtain no soldiers nor assistance of any sort from the Keng Ma Tossu, and were compelled to forego the visit. This constitutes the one doubtful element in my otherwise assured belief that there are no important mines, known or previously worked by the Chinese, in the portion of Area A, conceded to be Chinese territory, and south of the Nam Ting."

Other Mines in the Kawa Area

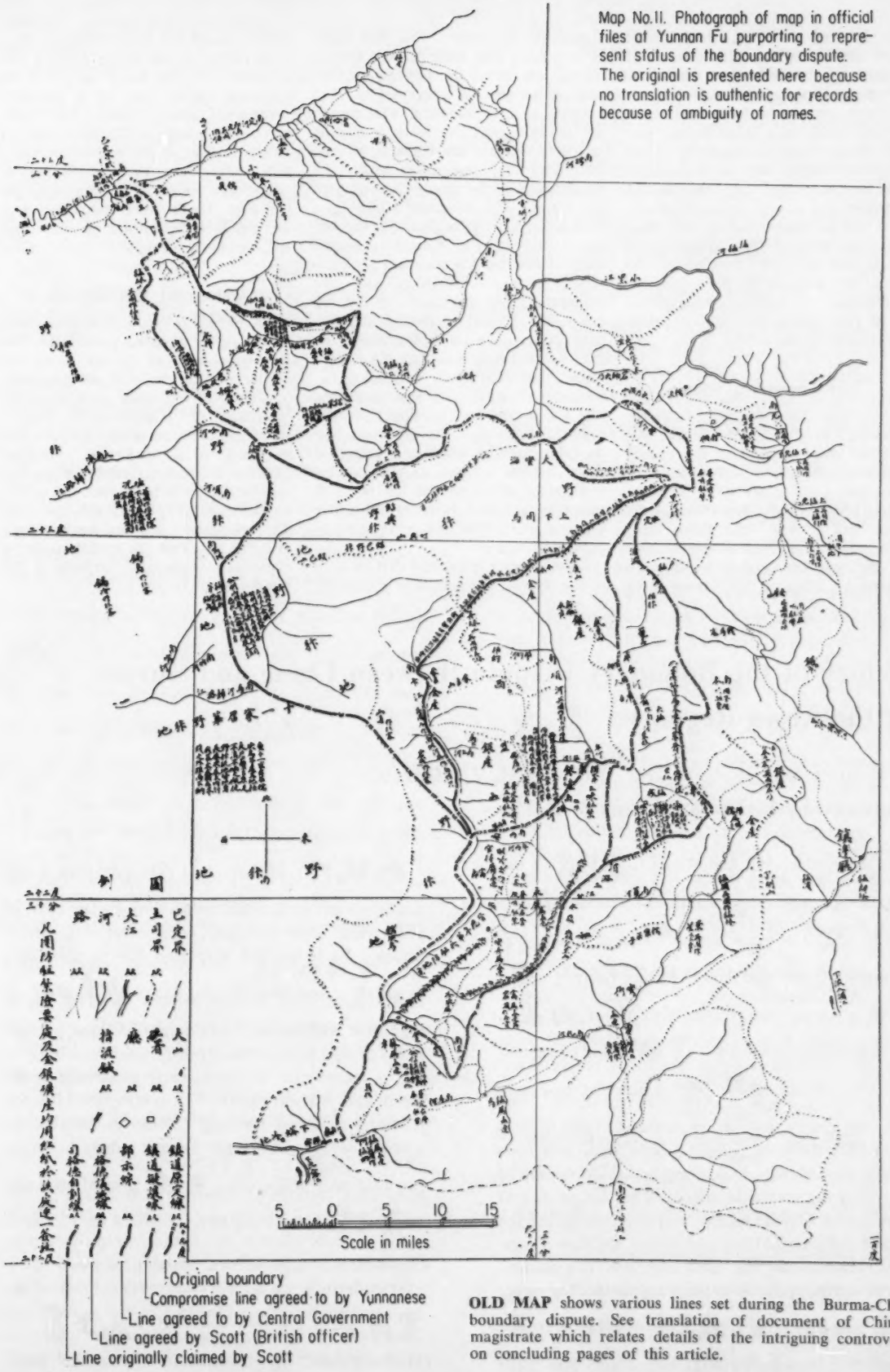
"The name Mu Nai is applied by the Chinese to two groups of mines. The principal one of these is the 'Old Camp' described above. This is said to have been the larger and more important producer. The other, or 'New Camp', is situated 70 li (24 miles) northwest of the 'Old Camp' west of the Kuo Shin Ho or eastern branch of the Nam Hka. It is thus on the east slope of the first range west of the Kong Ming Shan and about 15 miles west of the boundary as claimed by the British and well within the Kawa area.

"The best data on this and other mines in the Kawa area was obtained from Mr. Li, the former manager of the Chinese operations at the 'Old Camp'. According to him the New Camp is situated entirely in limestone, there being no other rocks as at the old camp. Work has not been prosecuted to anything near the extent of the Old Camp workings and there are only a few thousand tons of slag. There are, however, stopes 'as big as rooms' in which good ore is still exposed. The two principal mines bear the same name as those at the Old Camp—Tien Ba Dung and Lu Ho Dung. The Was will not permit the Chinese to work these deposits, else they would do so as the ore is rich in silver.

"Forty li (13 miles) northeast of the New Camp is Ying Kwang, also a lead-silver mine in the limestone. This is also called Shih Niu Chang and the ore is high in silver.

"Forty li westerly of Ying Kwang is Ai Chin Chang and still further

Map No.11. Photograph of map in official files at Yunnan Fu purporting to represent status of the boundary dispute. The original is presented here because no translation is authentic for records because of ambiguity of names.


5 0 5 10 15
Scale in miles
Original boundary
Compromise line agreed to by Yunnanese
Line agreed to by Central Government
Line agreed by Scott (British officer)
Line originally claimed by Scott

OLD MAP shows various lines set during the Burma-China boundary dispute. See translation of document of Chinese magistrate which relates details of the intriguing controversy on concluding pages of this article.

west is Tien Mai Chang, both of which are rich silver mines, formerly worked by the Chinese when the Kawas were not so 'wild'.

"There are also at least two mines, one of which is a gold mine, near Shih Ming where the headman of the Wa tribes stays. Mr. Li had never been to these mines but thought one of them was a very good mine.

"It will be impossible to visit these properties without first subduing the Kawas, and this is, in my opinion, too big a job for the present Yunnan government. If any of these mines are of real value, they will certainly be claimed by the British.

Ten Thousand Men

"The Mu Nai mine was formerly extensively worked by the Chinese. An inscribed stone in one of the ruined temples at the place was put up in 1816 and testifies to much activity at that period. The district magistrate states that at one time there were 10,000 men employed. Other reports put the number higher. The area covered by ruins of the former town would make it appear that this figure is too high. The mine is well known all up and down the border country, and as far east as Szumao and Puer as well as in Yunnanfu. The reason for discontinuing the work is usually stated to be that the Chinese miners, becoming very numerous, finally refused to pay the small tax imposed by the Lo Hu tossu of Mong Lien who governed the region and the latter called in the Kawas. Another story is that the Chinese and Mohammedan miners disagreed and the former induced the Kawas to kill the latter, the Kawas afterward showing great impartiality and killing all hands. It is undoubtedly true that the Kawas interrupted activity by beheading the miners at rather frequent intervals. The last incident of this kind occurred only 30 years ago. At this incursion they burned the town and killed or drove off the inhabitants and put up a piece of stone on the hill back of camp as a future boundary. Neither Chinese or Lo Hus can be induced to pass this stone.

"However, it is evident that in spite of the Kawas, the period of prosperity of the camp has been followed by a long period of dwindling activity and sporadic revivals, much as would be expected in the case of a formerly prosperous camp which had been worked out from a Chinese point of view. As near as the writer can make out, there were three orebodies of considerable size, as reckoned by the Chinese. These were exhausted and there followed a period of unsuccessful search for others."

Disputing the Border

As to the present situation, I can do no better than to present Li Tao Ki's translation of the status of the border dispute in 1921 as presented by Hsu Kai Yu. (See accompanying translation of "History of the Boundary Dispute Between China and Burma at the Kawa Region." Original Chinese characters, rendered in ink and brush, have been retained in the reproduction on pp 100, 101 and 102. The translation has not been edited, in order to retain the quaint mode of expression of some of the facts of the disagreement.)

History of the Boundary Dispute Between China and Burma At the Kawa Region

By District Magistrate of Lan Tsan, March 7, 1921.
Translated by Li Tao Ki, March 8, 1921

At the northwest of Lan-Tsan (瀾滄) district, along a high range of hills for an area of a thousand li, (里) or more, is the wild Kawa region. This consists of Upper and Lower Fu Lo Wang, (葫蘆王), Upper and Lower Kwe-Ma (困馬), eleven families of Chao-Fa (召華), and Upper and Lower Man-Nun (蠣冷). Each of these have their own chief and they are neither Chinese or Burmese. They are dark colored people, wear very little clothes, keep hidden, build their houses on the top of hills. They are very wild, indeed. They eat weeds and drink blood. On the second and third month of the Chinese calendar (March and April), the Kawas hunt human heads as offerings to the gods of the rice paddies.

Within this region there are many mines. The upper part of Nan-Ka-Kiang, (南卡江), Ku-Hsien (庫杏), Nan-Han (南罕), and also Nan-Si-Ho (南錫山), all have gold. The gold dust is carried down stream and has been shown by test to be of good grade. More especially, on the west of the divide between Ku-Hsien and Nan Han Rivers, there is a mountain called Wing-Kwang-San (永廣山), at the foot of which is the New Camp silver mine, particularly famous. In the Tsien dynasty, considerable silver was produced and was particularly productive in the eighth year of Kwang-Si (1882). It is reported that ten thousand men were working. Afterwards, because the Chinese miners did not pay enough tribute to satisfy the head man or Tu-Sze (土司), of Mong Leng (孟連), this head man influenced the Kawas to kill and drive out the miners, stopping the work.

Near the new camp, there are places, Ko-Ko-Tsai (果角寨), and Ma-Shan-Tsai (馬上寨), (Hsi-Ming-San), reported rich in silver which have

never been worked as they lie too far within the dangerous country.

In the thirteenth year of Kwang-Si (1887), the former Governor Tseng (岑), of Yunnan, conquered the Lo-Huhs (猓黑), and put one Ting (廳), office at Chuan-Lo (舂落), which is about six or seven days' journey from the Kawas. In the seventeenth year of Kwang-Si (1891), the Lo-Huhs rebelled, and were conquered again by the Tao-Tai (Taoyin) of Puerh. He located the Ting office in the Mong-Nan-Valley which is three or four days' journey from the Nas (Chen Pien Ting). Since the Lo-Huh have just been subdued, the Chinese have not yet conquered the Kawas.

After the British had obtained Burma, they conquered the upper and lower Man-Nun, Nan-Tung (南通), places about the fifteenth to twentieth year of Kwang-Si (1889 to 1894), then the British began to look forward to conquering the Kawas. On the twenty-second year of Kwang-Si (1895), the British officer, Scott, with four hundred soldiers came through Nan-Ka-Kiang taking Mong-Leng to Mong-Su (猛梭). The Chinese stopped him, after which he went back then through Mong-Leng. Scott was trying to confuse Kong-Ming-San (公明山), inside of the Chinese boundary with Kung-Ming-San (孔明山), the proper boundary. On the twenty-fifth year of Kwang Si (1899), Scott took the consul of Tengyueh to call on the governor of Yunnanfu and said, "In the fall, we shall settle the boundary in the Ka-Wa region, we request that the British must have the full Ka-Wa region, to save trouble. The original map made by the Peking delegate See-Fu-Chen (薛福成), is not satisfactory. The British have a small map, which should be satisfactory, and which has been sent with additional conditions of agreement, to the British Legation at Peking."

The Governor said, "The additional agreement made in the twenty-third year of Kwang Si (1897), concerns only giving up Ko-Kan (科干), to be governed by British, beside that no other boundaries have been changed. The additional map is only made for Ko-Kan part, which has nothing to do with the Kawa region."

The Governor suggested also to them, that the Kawa region neither belongs to China nor to Burma. We might just as well let them to be independent. But Scott and the consul think it is not a good policy to let them alone, and suggested, "... the best way is to divide those places near Yunnan to be governed by Yunnan, and these near Burma to be governed by British, equally dividing the Ka-Wa region. Both countries should send troops down to conquer the Kawas once for all." This suggestion has not been settled and the British officers were called back to Burma.

Later in the same year, Scott was appointed by the British Government as boundary commissioner. The Yunnan Government sent down the Tao-Tai of Puerh by name of Cheng-Isan (陳燦), with the assistant Liu-Wang-Sheng (劉萬勝), to have conference with the British officers to settle the boundary. The British first asked to have all the upper and lower Fu-Lo-Wang and all the Ka-Wa region to be governed by the British. Our Chinese officials never promised. Finally, both agreed to equally dividing the Ka-Wa region.

Then the British joined the Chinese and sent a native man by name of Ma-Kao-Hsing (馬國興), and his assistants, seven altogether, with gifts or presents down to the Kawa region to explain the conditions of settling the boundary, but these messengers were killed by the Kawas. After that, the Kawas defended themselves more carefully than ever, so both decided to come to the Chinese side and sketch out the boundary lines from the high hills. When they sketched up to Mong-Go (猛角), and Mong-Tung (猛董), three of the British party did not consider serious enough of the Kawas and rode into one of their villages without escort. Two of them were killed and one was wounded. Both Chinese and British then sent down large numbers of troops in hope of subduing the region: they fought for two days and captured only one old Kawa and burned the village. On account of the fighting is too difficult in the wild country, both took back their soldiers.

After that fight, the British changed their mind again disagree the equal dividing suggestion. Said again the original map made by See-Fu-Chen is not satisfactory, theirs, the small map, should be good. British line is start from the water shed ridge between the Big and Small Han-Kung-Ho (大小南滾河), turn to the watershed ridge between Mo-Kiang (渼江), and Lin-Kiang (潞江), then down to Shu-Hing-Tsai (蘇幸寨), on the Nan-Ka-Kiang (南卡江). They again try to confuse the Kong-Ming-San (孔明山), inside of the Chinese boundary as Kung-Ming-San, which is the proper boundary. So they took in the Mong-Mou (猛茅), used to be governed by Mong-

Ko (猛角), Hsi-Ming-San used to be governed by Mu-Nai and Mong-Long and also the villages in the east of Nan-Ka-Kiang. What they have done is entirely wrong from what the original agreement says, "That Mong-Ko and Mong-Tung are governed by Chinese, and from there follow the high ridge of Kung-Ming-San down to Mong-Long are governed by Chinese too."

Chinese disagreed the British line, so each claim a different line. The British secretly marked on the trees and stones along the east bank of Nan-Ka-Kiang.

The Chinese line starts from the mouth of Wan-Pa-Ho where joins Nan-Ting-Ho (南定河), there is a boundary stake No. 97. Both been agreed, from there follow the river up to Dunn-Ka-San (東卡山), put in Stake No. 1. From Dunn-Ka-San southward to Fu-Ban (戶板), put in Stake No. 2; southward again to Man-Ka (蛮卡), put in Stake No. 3. Follow the ridge of Kow-San-Ling (高山嶺), to Mong-Ling-San (猛林), that divides the east side of Ban-Haung (班王洪), villages for China and west Se-Ban-Kwang (西班況) for British. Follow the ridge Mong-Ling-San (猛林山) to Pa-Chang-San (怕唱山) southward to Nan-Kung-Ho (南滾河) cross Nan-Tung-San (南通山), and to Kung-Ming-San. That separates Mong-Mau (猛茅), and east side of Kung-Ming-San for China. Cross Nan-Ma-Ho (南馬河) follow the ridge again but eastward to Nan-Ka-Kiang. All the San Tung (山通) Nai-Cheng (岩成) villages are belong to China. Follow the river down and connected the fixed boundary stakes again.

The above history is about the two boundary lines settled between China and Burma along the Kawa region. The chief important point is to make clean this Kung-Ming-San, if this is fixed, then the whole problem can be solved. One village called Mong-Mon, or called Sing-Ti-Tang (新地方), on Kung-Ming-San, used to be governed by Mong-Go (猛角), and they paid taxes to China. Afterwards, though, the Kawa rebelled, but the place used to governed by China can be proved from the record. According to the agreement "Mong-Go for China," and these places are used to be governed by Mong-Go, consequently these places are Chinese.

Other places like Gong-Hung (拱弄), Gong-Yun (拱勇), and See-Mong-Lung (小猛弄). They were governed by Mong-Go too. Scott sketch in their line entirely wrong too.

However, whatever Scott sketches, the places used to be governed by China which can be proved through the old records.

All the villages of Nu-Nai and Hong-Long are all used to pay taxes to China. The chief of Shih-Ming by name of Lee-Lung-Ming requested to be governed by China on the seventeenth of Kwang-Si (1891), which has been reported and recorded at Peking. And they paid taxes to China all these years. Again the east side of Nan-Ka-Kiang. All the villages were governed by Mong-Ling-Fu-Sze (head man), and Chinese had ports and soldiers all the years. Recorded once two bandits escaped from there to British side, and was notified by Chinese to British and request them to catch them and send back to China. The British did the same.

All these proofs which are recorded, show the Chinese have the absolute right of having the region, but the British are too greedy, we proved to them and they won't listen to it so that the boundary is still unsettled for twenty years now.

LETTERS

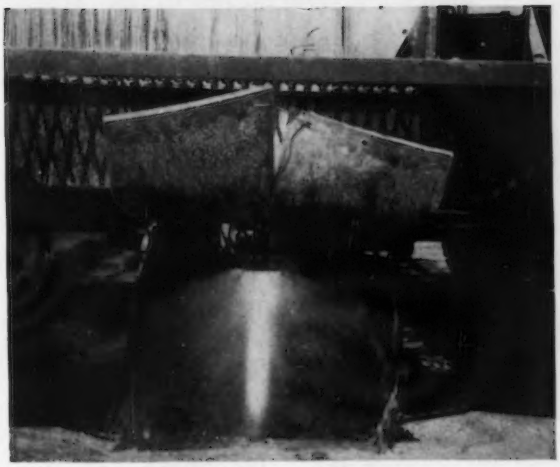
I have read in *Engineering & Mining Journal* the article by Oscar Davila on "Tin Ore Treatment at Empresa Minera Catavi" and the letter of D. C. Deringer, former general manager of Patino Mines & Enterprises Inc. Cons.

As an engineer who faithfully served Patino Mines from 1945 to 1952, I feel it necessary to correct some of his observations. The political side of the question are Mr. Deringer's own interpretations and are not the subject of this letter.

I worked for Mr. Deringer from 1947 until nationalization. In May 1949 I was seriously wounded in an uprising against the company officials. In that same revolt two American engineers were killed and several others badly wounded, only because we defended the Patino interests to the best of our abilities. One should not forget that in that time Patino thought it necessary to maintain three regiments of soldiers around Catavi to keep order, which was obviously resented by the miners and did not help public relations with the company, an some day had to come to a head, as it did in '49.

After nationalization, most European and Bolivian engineers stayed, mostly because of economic necessity. It was logical that in an American company (Patino Mines) the majority of engineers were of American nationality and that European and Bolivian engineers did not have the same chance for promotion. But in no way does this mean that they are second rate engineers with below standard capacity; on the contrary, the actual organization, improvements in mine, mill and shops, planning, etc., show that this mining enterprise comes technically up to first rate standards, as

(*Continued on p 160*)



ROCKET FLAME, key to thermal drilling of rock, develops up to 500 hp in this single jet from a suspension type burner.

TYPICAL HOLE produced by a rotary burner in taconite makes mining this hard, lean iron ore economically feasible.

Jet Piercing—the Miner's Rocket

LLOYD E. ANTONIDES

ROCKETS are usually considered to have no present industrial application. However, the rocket burner is the key to an important industrial process known as "Jet Piercing". An outgrowth of oxy-acetylene flame process studies, under development before World War II, this thermal method of drilling rock has been highly perfected in the last several years by Linde Co., Division of Union Carbide Corp. Linde owns or controls a number of patents relating to the jet piercing process and apparatus. On June 4, 1957, U. S. Patent No. 2794620 was granted on a burner and method of operation. Much of this article is based on that patent.

Basic differences between military and industrial rocket equipment were described by F. R. Job, Linde Co. project engineer, in an article in *Jet Propulsion*, April 1957: "Military specifications usually require maximum thrust and minimum weight. Industrial rocket equipment is usually designed for low-cost operation over extended periods with minimum maintenance. In industrial design, attention is focused on the effect of the flame on an object rather than the effect of the flame on the burner or rocket motor."

Jet piercing first gained fame when it helped make Minnesota taconite an economic source of iron. Since then its use as a primary blasthole drill has spread to Michigan jasper iron ores, to syenite and to granite and quartzite crushed stone quarries. Last year it proved the most efficient method of drilling Potsdam sandstone on the St. Lawrence Seaway excavation (E. A. Buie, *Can. IMM Bull.*, June 1957).

Rocket burners have also been adapted to other uses. A small model has been designed for use like a jackhammer for blockholing. Another has established itself as being at least four to five times as fast and considerably lower in cost than older methods for cutting channels in dimension stone quarries. In addition, a small unit has proven advantageous for shaping and finishing dimension stone. Outside of mining, the burner is industrially useful for cleaning of structural metal shapes. This article is primarily concerned with its application to primary blasthole drilling.

Basic Process Is Simple

Jet piercing is a non-contact method of continuously breaking an opening through rock. It employs a concentrated flame of high temperature and high velocity. The flame, less than 2 in. in diameter by 18 in. long with a temperature of about 4,000 deg F, causes the rock surface to spall and break up due to differential thermal expansion. To prevent or minimize melting, the velocity of about 6,000 fps quickly sweeps particles away and continually exposes a fresh surface. At its highest velocity this small jet flame has a mechanical energy equivalent of 500 hp. Such a jet flame or rocket represents one of the highest concentrations of energy available to man.

To develop such a flame, a liquid hydrocarbon fuel such as kerosene is combined with high-purity gaseous oxygen. Combustion of the oxygen and hydrocarbon—both under pressure up to 250 psi—takes place inside a chamber and the burning gases jet out of small ports.

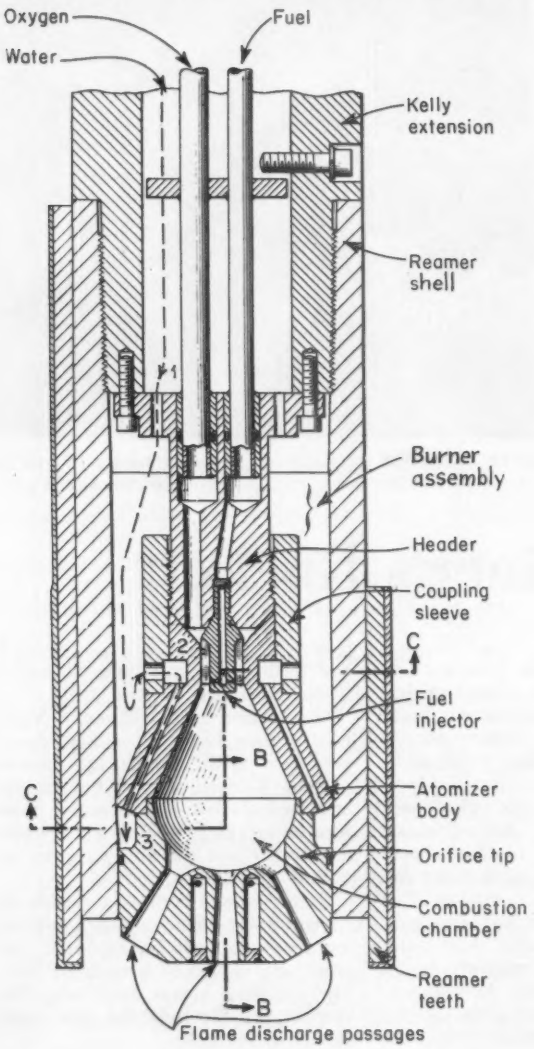
Water is used both as a circulating coolant in the burner and as a quenching spray to solidify, embrittle and crack any melted or heat fused rock. The resulting steam also helps the existing gases to flush the rock particles from the hole.

Silica is especially susceptible to heat spalling because, in addition to thermal expansion, it undergoes a phase and volume change at 1100 deg F. It also has a high melting point of 3100 deg F. Thus the method works best in rock that contains quartz. However, silica is not essential; the process also works well on dolomite and syenite. But trap rock and rocks high in mica or plagioclase are not efficiently jet pierced as yet.

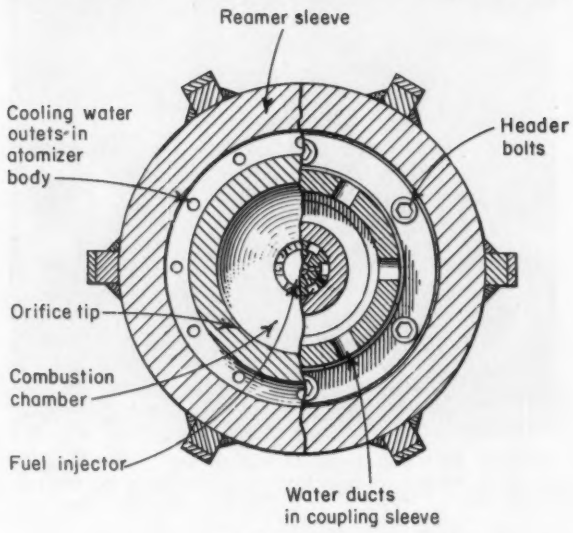
Vertical down-holes are drilled almost exclusively. Inclined holes are now generally limited to small hand-held burners although a large horizontal rig was devised early in the development of the method.

To advance the rocket chamber or burner, two different mechanical actions are employed. One system provides for continual rotation of a multiflame burner which is attached to a long rigid drill rod. Blowpipes of this type are equipped with external ribs.

Burner for Piercing Rock Is One of Few Industrial Applications of the Rocket



SECTION A



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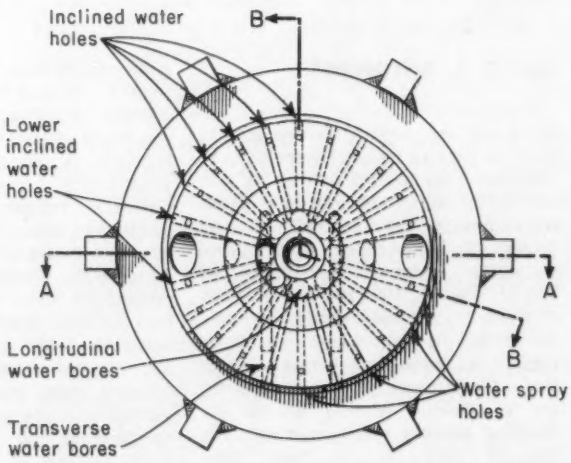
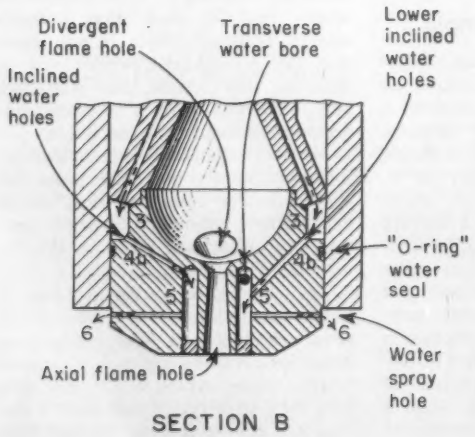


FRONT END VIEW



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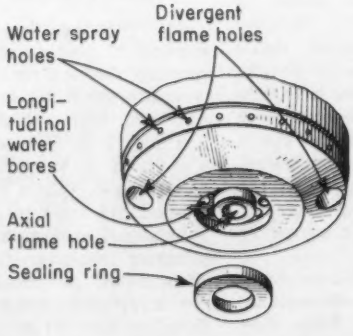
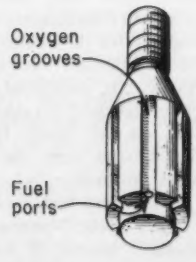


ORIFICE TIP FACE



FUEL INJECTOR

This system is especially effective in penetrating formations that are fractured or of irregular composition. The second system provides for churning of a single flame burner attached to a shorter rod which is suspended on a wire rope. These blowpipes have a smooth exterior. This system is simpler, lower in initial cost and more easily adapted to greater depths.

Blowpipe Design is Intricate

The steel drill rod (stem, kelly or blowpipe) is hollow and two metal tubes pass through it. One tube is for oxygen and the other is for fuel. Water flows through the blowpipe around the reactant tubes. A typical suspension drill stem is 5 in. x 20 ft and a typical rotary kelly is 5 in. x 55 ft. Flexible hoses connect the blowpipe to the process fluids supply. The top of the rotary blowpipe is fitted with a special swivel joint. On suspension blowpipes, supply hoses are fastened to the cable at intervals as the hole increases in depth.

Lower end of the blowpipe (see drawing) consists of three main components: kelly extension, reamer and burner assembly. Burner assembly bolts onto, and reamer screws onto, kelly extension, which is simply a short replaceable section of stem.

The reamer shell protects and supports the burner assembly, forms a water jacket around it and also serves as a minimum-hole gage. On a rotary burner, hard-faced ribs with projecting ends (teeth), are welded on the exterior. They prevent damage to the face of the burner and help to pierce melt seams, grind up large particles and smooth sides of the hole. Adjacent ribs are of different lengths to reduce drag on the side of the hole. The long ribs are slightly tapered or stepped down (e.g., ⅛ in.) away from the projecting tips for the same reason. On the suspension burner, the reamer shell exterior is smooth and the inside of the lower edge may be beveled but the face of the burner usually projects about ⅛ in. With the suspension burner, to remove "collars" or penetrate melt-seams, the entire blowpipe can be replaced by a small churn drill-like bit and stem—3 in. x 8 ft — called a "toothpick".

The burner assembly includes: header, fuel injector, coupling sleeve, atomizer body and orifice tip. The fuel injector screws into the header; and the coupling sleeve, atomizer body and orifice tip are silver-soldered together into a unit assembly which screws onto the header over the fuel injector.

Header attaches to kelly extension and is cylindrical with flange on one end. Flange is bored longitudinally for attachment bolt holes and for water ducts. Other end is externally threaded for attaching coupling sleeve and axially tapped and threaded for attaching fuel injector. Body has longitudinal bores of special configuration for conducting oxygen and fuel from tube ends toward injection point. Oxygen bore terminates at the face of the header adjacent to fuel injector, while the fuel bore ends in the bottom of the screw-hole for fuel injector.

Fuel injector is cylindrical with one end having a tapered shoulder ending in a threaded neck which screws into the header. Body has external grooves through which oxygen passes, and an axial fuel-conducting bore extending from end of neck almost to other end (chamber end) of body. Near this latter end, the body is pierced by radial holes which connect axial bore to bottom of external grooves. Grooves can be omitted—in which case the body is of smaller outside diameter—but they are desirable for better combustion and reduced erosion of the injector.

The coupling sleeve joins header and atomizer body. It is a short tube, with one end internally threaded for screwing onto header and the other end radially drilled for water ducts.

Atomizer body is shaped something like a thick-sided funnel. Outside edge of the "funnel lip" fits tightly inside reamer shell. "Spout" fits tightly over "lands" on fuel injector and fits tightly inside coupling sleeve, to which it is silver-soldered just above water holes. The inside edge of the "spout" is beveled. This beveled surface, the sloping shoulder of fuel injector, and the face of header form a ring-like space of triangular cross section. Opening into this space are both the outlet of the oxygen bore in the header and the inlet ends of the oxygen grooves on the fuel injector. An annular groove around the outside of the base of the "spout" aligns with water holes in the coupling sleeve. From this groove down to the lip of "funnel" the atomizer body contains longitudinal cooling-water holes.

Orifice tip, a short cylinder of rather complex internal shape, also fits tightly inside reamer shell. One end has a hemispherical (or other round-shaped) depression which aligns with the inside of the "funnel" on the atomizer body to form the enclosed combustion chamber. Outside diameter of this end of orifice tip is turned down so that it forms a ring-like opening between the inside of reamer shell and the outside portion of the "funnel lip" on the atomizer body. Outlet end of water holes in the atomizer body open into this space and a rubber "O-ring" water-seal gasket encircles the orifice tip just below this space. Remaining shoulder on this end of orifice tip is silver-soldered to the atomizer body.

On the other end of the orifice tip, leading from the combustion chamber out to the external face of the orifice tip, are flame discharge passages—a single axial (longitudinal) one on suspension burners and two more on rotary burners with the outer two diverging symmetrically. Passages may be of various shapes, but a narrow throat is one notable characteristic. Each passage in a rotary burner has a cross-sectional area smaller than the passage in suspension burner but the total orifice areas are equal.

Number and direction of flame discharge passages in the orifice tip is dictated by the tendency of the rock to form collars (annular obstructions) in a hole due to irregularities in the formation. Such collars must be reduced to a minimum because removal requires time-consuming manipulation of the blowpipe. Collar cutting efficiency can be raised by providing at least one flame which diverges from the longitudinal axis. Of course, such multi-flame burners are really effective only on positively rotated burners. The passages should not diverge more than 45 degrees to keep the piercing component greater than the gaging component. The most efficient angle depends on optimum "standoff" —the distance measured along the longitudinal axis of the passage from orifice mouth to rock face—which is 2 to 4 in. Example in the Linde patent gave rotary blowpipe with 6½ in. tooth-gage and two passages diverging at 30 deg from axis, in which case it was 3¼ in. from orifice mouth to a projection of the tooth-gage.

Surrounding the flame holes are several sets of interconnected drillings and borings for cooling water. The patent drawing shows one scheme. Newer models have simpler arrangements that are just as effective. Generally at least one set of inwardly inclined radial holes conduct water from the water ring (which encircles the joint between the orifice tip and the atomizer body) down to one or more larger borings around the axial flame hole. To discharge a water spray out against the reamer sleeve and teeth and the rock, another set of small radial holes runs from the larger borings perpendicular or slightly inclined to the rear, out to the periphery of the orifice tip just below the end of the reamer sleeve.

Heat and Wear Problems

Cooling of the burner assembly is necessary to prevent softening, melt-

ing and/or burning. It is accomplished by water—10 to 17 gpm delivered at about 50 psi pressure—circulated at high velocity through a complex network of conduits. Coolant passages are separated from the combustion chamber by about ⅛ in. of metal and the number and sizes of passages are such that water velocity is 15 to 30 fps. Velocity increases in steps going toward the outlet in order to eliminate air pockets by keeping water under increasing pressure. High velocity water cooling increases burner life considerably compared to tank type water cooling. By cooling the atomizer (and injector) in this way, the patent says life has increased 10 to 20 times that of previous constructions. Discharge of water against the reamer sleeve and teeth has also lengthened their lives considerably by preventing flame-gouging or melting.

Erosion by gases influences geometric design of the injector, combustion chamber and discharge orifices. Erosion of the face of a former plain conical injector restricted service life to about 300 ft of hole but with the groove design, 3,000—4,000 ft of hole have been pierced without difficulty.

Conical flare of the atomizer body also minimizes erosion by combustion gases and increases chamber life over previous design. Life expectancy of the atomizer body at one property (U. S. Steel) was given as 12,000 ft of hole. Likewise to keep erosion to a minimum, the chamber-forming depression in the orifice tip must have no abrupt changes in cross section to insure smooth streamline flow. In addition to the hemispherical shape, the patent mentions that paraboloid, ellipsoid or other shapes are also feasible.

To further cut erosion, flame discharge passages are designed with an approach section which merges smoothly with the wall of the combustion chamber. This usually conical section converges to a throat after which comes a relatively long divergent conical section out to the exit. Although a cylindrical section can be used for the latter, the flare increases the velocity of the gases above sonic and aids in lighting the burner.

Abrasion by spallings has been another important consideration in the design of the burner—especially the orifice tip. It is usually the controlling factor in useful service life. It can result in flame distortion (from worn orifice) or flame dilution (from cooling water leaks). With the present design, an orifice tip life averages 200 hours of operation or roughly 4,000 ft of hole, according to patent and reports of rotary units operating in taconite (U. S. Steel).

Abrasive wear of other parts on the rotary unit at the same taconite pit was reported by giving the following life expectancies: reamer—80-100 ft per build-up, 20 build-ups (hard-facing); kelly extension—5,000 ft per build-up, 4 build-ups; blowpipe—10,000 ft per end before rebuilding by hard-facing with electric arc, number of build-ups not known (March 1956); exhaust fan rotor—12,000 ft per replacement.

Combustion & Flame Are Factors

Good fuel utilization, the patent says, is promoted by directing a ring of longitudinally flowing gaseous oxygen streams at high velocity toward the chamber while concurrently directing out into the oxygen streams from within the ring, many radial streams of liquid fuel flowing substantially normal to the oxygen stream. Injecting fuel in a number of jets increases the surface area available for atomization; and the shearing action of the oxygen streams improves atomization of the fuel and mixing of the fuel with the oxygen.

Combustion stability and performance of rocket burners are greatly affected by variations in process fluid pressure. "Chugging" or high frequency self-sustaining oscillations in the supply lines are the crux of the problem. Such pulsing may develop a peak pressure in one line when there is a low in the other and thus change both the fuel ratio and mass flow, and hence flame geometry. Length and geometry of supply system are major factors and create a problem in mining applications because they must be varied. As F. R. Job says: "[Drilling] . . . dictates that control valves and other regulating equipment must often be as far as 200 ft away from the burner. For [ease of operation, simplicity of equipment, etc.] it is desirable to use low-pressure systems, i.e., sometimes less than 50 psi . . ., even though such systems are inherently unstable . . . [and] . . . are much more sensitive to the effect of feedline length and configuration. In fact, under some feedline length configurations, continued ignition has been impossible with burners that otherwise operated very satisfactorily."

Regarding pressures, the burner patent states: "Pressures between 10 and 250 psi (gage) can be maintained in the combustion chamber but for best results pressures from 15 to 150 psi are used, with a combustion temperature of about 5500 deg Rankine [5960 deg F] for oxy-kerosene. These relatively low chamber pressures . . . [reduce those needed] in the oxygen and fuel supply conduits. Previous burners had to be operated at 150 to 200 psi and required commensurately higher pressures in fluid systems."

Good combustion characteristics of the design permit a wide range of "L*" ratios (chamber volume/orifice area)—from 14:1 to 121:1 with 20:1 to 80:1 preferred, according to patent. On a given size burner this permits changes in orifice area from wear or for changing flame shape ("geometry") or sweeping effect ("momentum"). Conversely, it permits using various size burners for particular applications.

It is interesting that for a given mass flow and a given orifice area, the jet has the same thrust regardless of chamber volume so long as sufficient volume or time is available to complete the combustion reaction.

Characteristics of rocket burners found to be of primary interest in industrial applications according to Job's article are heat transfer, flame momentum, flame geometry and noise. As might be deduced, chamber pressures, orifice design, mass flow (quantity of process fluids) and fuel/oxygen ratios have an interrelated effect.

Data Summary

To summarize Job's brief data:

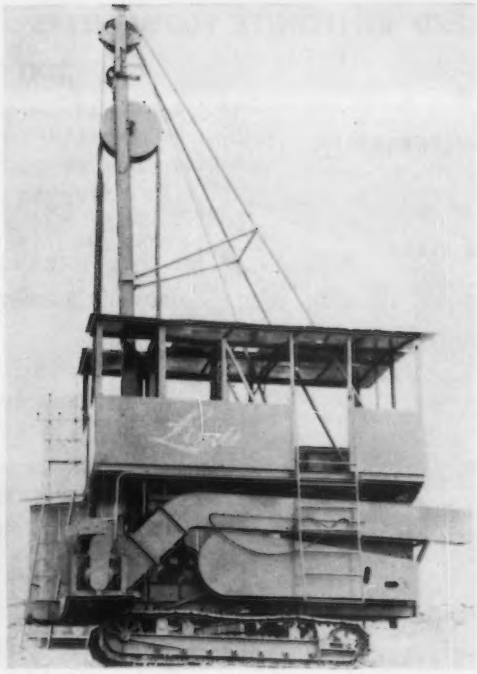
For heat transfer, standoff appears to be a most important variable; and with established conditions of fuel ratio, pressures and nozzle design, standoff distance of 2-4 in. appears to be best.

For flame momentum, standoff distance appears to have practically no effect while orifice design, mass flow and pressure are major influences.

Flame geometry apparently is best controlled by nozzle design.

And noise—while not a problem in jet-piercing blasthole drills because a few feet of drill hole is a very effective muffle—is increased by flame velocity and temperature, although high and low pressure burners show little difference in over-all noise level.

In conclusion, the patent states "the blowpipe described in detail above has a considerably longer useful life than rock piercing burners available previously. It also makes possible higher piercing rates than heretofore. Furthermore, it makes possible the piercing in rock of an easily loadable hole of quite uniform diameter and contour while providing a maximum of explosive-loadable hole volume per unit of oxygen consumed. Also, it is rugged in construction and can easily be taken apart and reassembled for the replacement or repair of parts.



Rotary or Churn Type Drill Rigs Are Used

RIGS USED FOR JET PIERCING are basically the same as the standard rotary or churn drills used for blastholes and wells. But they are considerably modified to accommodate various feeding, indicating and control devices. Special drill rods are also used and of course the bit is replaced by a burner. (Rods and burners are described in the text under "Blowpipe Design".) More costly rotary units are especially effective in "ragged" ground while "suspension" units are easier to adapt to greater depth.

Rotary piercing units usually operate at 10 to 15 rpm although a 30 to 50 rpm range is available for exceptionally difficult rock formations. On these highly automated rigs the process equipment—pumps, meters, control panel, etc.—is an integral part of the machine. The rigs are self-propelled and designed for operation in weather down to minus 35 deg F.

On suspension units, spudding strokes average about 4 in. at 50 cycles per minute although the available range is 2 to 18 in. at 30 to 90 cycles per minute. These rigs are often standard churn drills that have been modified by adding a hose sheave and feeding apparatus, a hole exhaust system, and an upper deck serving as an operator's platform—as well as various pumping, indicating and control devices. Suspension rigs are not as fully instrumented or automated as rotary rigs.

Auxiliary equipment also includes apparatus to store and deliver gaseous oxygen, liquid fuel (usually kerosene) and water. Fuel tanks are an integral part of the rigs. Movable and mobile oxygen and water supply units can be used as well as stationary installations with pipelines. For cold weather operations the mobile water wagons are heated. The mobile oxygen wagons consist of a battery of long cylinders with automatic valves.

Hole Size

Diameter of holes produced is rather irregular—principally because of variations in rock characteristics. Minimum diameter is that of the reamer—commonly 6½ in. for rotary burners or 5 in. for suspension burners. Large diameters are readily produced by slow rates of advance and/or multiple passes. Multi-pass chambering to 18 in. dia is not uncommon and over 24 in. dia have been reported. Chambering may be done at any point in the drill hole. On rotary rigs the diameter may be continuously recorded versus depth by a specially developed electro-mechanical, three-fingered caliper—the "contourometer". It is common practice in loading explosives to use canned agents on detonating cord along with water-proofed pellets which fill the irregular annular space. Spallings are used for stemming.

Hole Depth

Depth of holes with the suspension rig is limited by the length of supply hose which still permits maintaining needed process fluid injection pressure. On rotary rigs depth is limited to length of special drill stem that can be handled, which is limited by the weight of the machine that is most compatible with terrain and mobility desired. With suspension rigs, deepest hole that has been reported is 180 ft. So far rotary rigs have been reported only on holes under 50 ft.

Drill Speed

Drilling speed with a rotary rig in Minnesota taconite (at U. S. Steel as reported by I. H. Rubow in *Mines Magazine*, March 1956) was 10-35 ft per hr on holes averaging 40 ft deep and 8½ in. dia with bottom 5 ft chambered to 10 in. dia. Shift footage averaged over 100 ft per shift with best shift giving 200 ft and best month averaging 139 ft per shift. Job's article mentions that rotary piercing on the Mesabi averages 15-23 ft per hr. With a suspension rig in Arkansas nepheline syenite (at Big Rock Stone as reported by T. M. Howell in *Mining Engineering*, June 1957) drilling speed averaged 18 ft per hr on 150 ft holes averaging 10 in. dia, over a four-year period. Job's article says suspension rigs have exceeded 50 ft per hour in some formations and the average rate in granite is considered about 20 ft per hour.

Cable tension—on both rotary and suspension rigs—shows when the reamer or burner face is contacting the side or bottom of the hole and is used for regulating maximum speed of penetration. Resistance to the torque of the rotary drive mechanism is another useful drag indicator for regulating penetration. The most recent development for rotary units is an automatic speed regulator—the "yo-yo"—which uses a cyclic probing principle to maintain an optimum (about 4 in.) "standoff" distance. Of course, actual speed may be governed by desired diameter of hole.

Consumption of Fluids

Consumption of process fluids are fixed flows of 10,000 cubic ft per hour of oxygen and about 40 gal per hour of kerosene. Water consumption is 600 to 1000 gal per hour. Big Rock fed oxygen at 180 psi and kerosene at 100 psi while U. S. Steel stated is was "over 100 psi" for both. Water is normally fed at 50 psi. Mobile oxygen and water supply units are used at U. S. Steel and stationary installations with pipelines is used at Big Rock Stone. Process fluids are the major operating cost—with oxygen being 50% of total, according to Rubow. Unit price of oxygen varies depending on volume consumed.

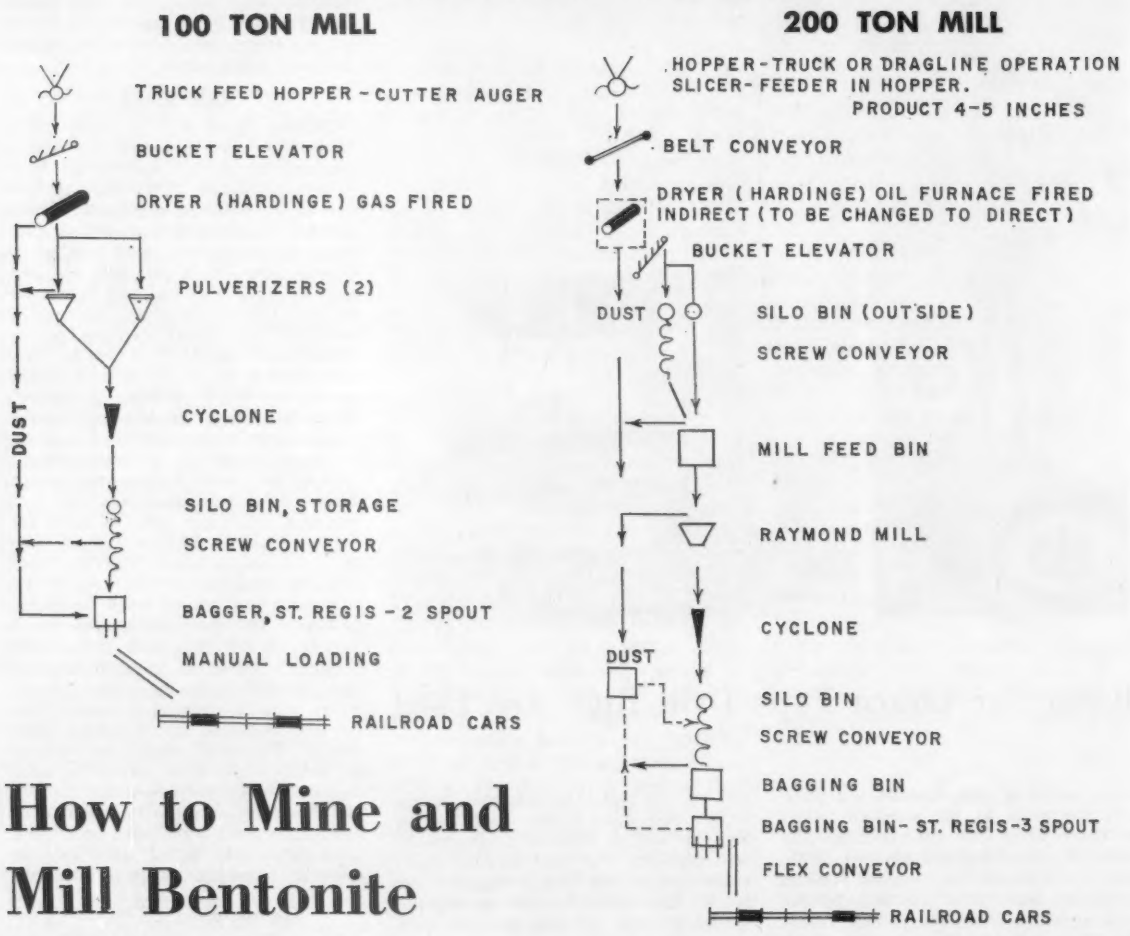
Other Costs

Royalty for use of process is based on fuel consumption.

Power consumption is slightly higher than that for the basic rig used. Howell reports an additional 30 hp on the converted electric churn drills.

Labor costs approximate that for the basic rig in both amount and rate according to Howell.

Maintenance, essentially replacement of parts, according to Big Rock's experience is about 10% of other direct costs. (See section on "Cooling and Wear".)



How to Mine and Mill Bentonite

DANIEL S. TURNER

BENTONITE is available in Wyoming. Bentonite is a more significant commodity than we might be led to believe—the Union Pacific Railroad rates the clay industry as fourth in freight loadings on their lines through Wyoming. We should like to discuss these Wyoming occurrences, the mining methods used, and to present three idealized flowsheets for mills of 100, 200 and 300 ton capacity.

Bentonite clays are well known in the geologic section of the Upper Cretaceous in the State of Wyoming. These rocks, composed of a section of very thick black fissile and massive shales, as well as some thin sandstone lenses, aggregate thickness of 10,000 ft in eastern Wyoming. The Mowry shale of Wyoming is a well known siliceous and platey silver-weathering brittle shale lying above the Dakota formation. In the Black Hills region a bentonite bed lying above the Mowry shale is known as the Clay Spur bentonite. This well-known marker horizon in the geologic section can be used throughout a large area of northeastern Wyoming. Other seams of bentonite clay are known throughout this area in, particularly, the lower part of the Frontier formation.

Bentonites of this horizon have been exploited over a wide area of northeastern Wyoming as commercial clay deposits. The literature, however, is noticeably sparse on the economic aspects of bentonite, its mining and processing. It is our intention here, therefore, to add a few observations on the experiences of mining and a brief resume of the economic potential of bentonites including standard processing procedures as generally applied in the Wyoming industry.

Bentonite occurrences throughout this area have been studied and reported in considerable detail, including physical and chemical analyses by many authors, particularly the Wyoming Natural Resources Research Institute in Laramie. These studies, combined with the results of studies throughout the world, have shown that bentonites are the product of alteration of volcanic ash and acid type lavas. Apparently the conditions under which volcanic ash was laid down in the geologic section in Cretaceous time varied considerably. It is quite possible to envision the accumulation of volcanic ash over a very wide area during periods of Cretaceous volcanism, wherein that ash may be deposited in quiet saline waters at one point, in relatively fresh or brackish waters in another locality, and upon exposed dry land masses, all at the same time. Variations in the chemistry of the alteration process under these different conditions might be expected to produce wide variations in the quality of the end product.

Alteration processes probably occurred in place before the ash deposits were lithified and exposed to the weather. Chemical changes within the ash deposits were mainly those of hydration, solution, loss of silica, and base exchange between the materials in solution, at the site of deposition, and the glass-like ash. That change

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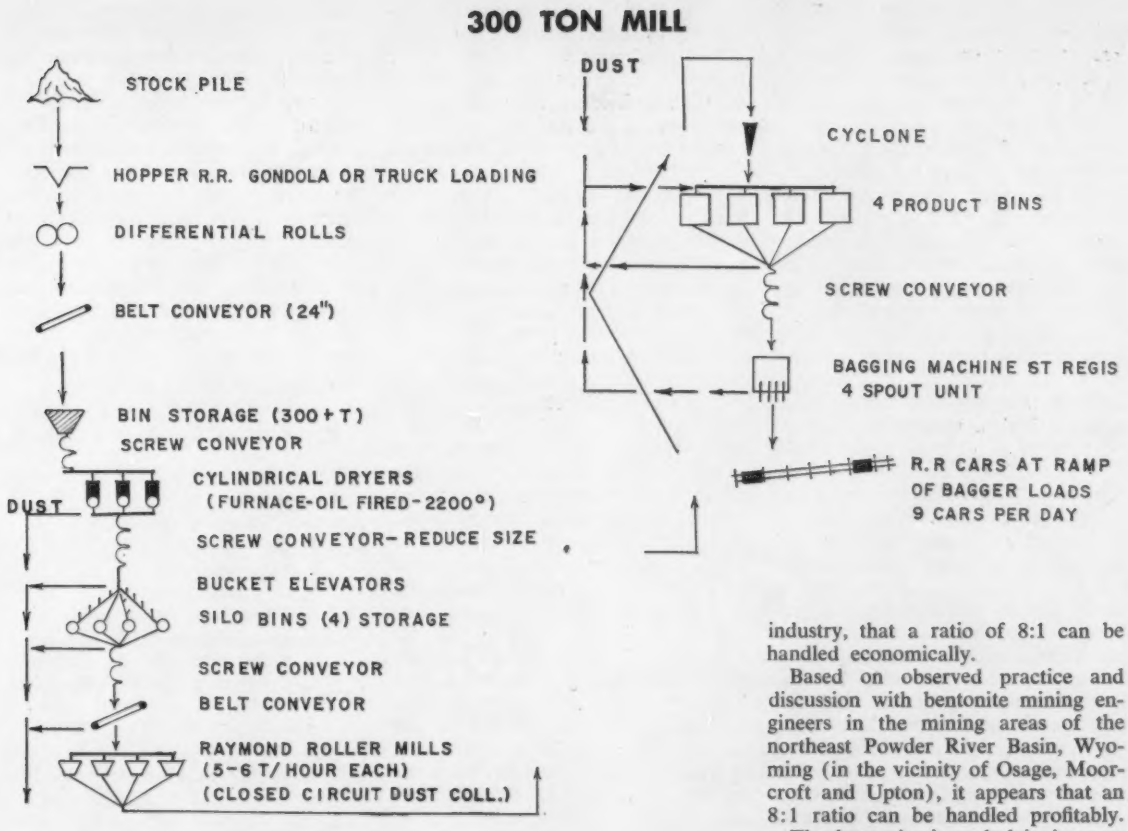


is a complete chemical conversion from amorphous material into crystalline montmorillonite.

Residual materials resulting from this chemical change frequently were high in calcium sulphate. Crystallization of selenite is a common associated mineral with most bentonites, and is considered to be the later crystallizing material resulting from the formation of bentonites (montmorillonites).

Clay Properties Vary

Most bentonites are light cream colored clays, with exceptionally high colloid content which have the unusual property of being able to absorb large volumes of water and thereby may swell to as much as 20 times the dry volume. Other types of these clays may be classified as relatively non-swelling bentonites. These variable properties of a clay and its high colloid percentage are the major properties sought by the clay industry. It is not the purpose of this summary to dwell on colloid chemistry or to explore the diagenetic process of the origin of bentonites. Our purpose is to note the economic aspects of the bentonite industry and the problems and processes of mining and beneficiation.

Where bentonite crops out, the economic potential of each deposit is controlled by three major factors: (1) Attitude of the beds (angle of dip of enclosing units). (2) Degree of dissection of the overlying Frontier formation. (3) Tonnage of overburden to be removed.

The angle of dip of beds is of major concern since high angles of dip in most places means thick overburden. Degree of dissection of the rocks above the bentonite is important, because erosion may have removed or contaminated large volumes of the bentonite clay. Likewise, strongly dissected Frontier shale outcrops may enhance the mining possibilities because of the removal, through the natural process of erosion, of a large volume of overburden.

In a lightly dissected area, deposits of bentonite may not be considered commercial because of prohibitive volumes of overlying shale remaining in place. In the early days of development of bentonite properties, before the common use of large earth moving equipment, a ratio of the thickness of overburden to the thickness of bentonite clay was established at three to one. With the relatively recent development of large prime movers for earth work construction, it has been proven, in the Wyoming bentonite industry, that a ratio of 8:1 can be handled economically.

Based on observed practice and discussion with bentonite mining engineers in the mining areas of the northeast Powder River Basin, Wyoming (in the vicinity of Osage, Moorcroft and Upton), it appears that an 8:1 ratio can be handled profitably.

The bentonite is underlain in most locations within the area by the hard brittle siliceous Mowry shale. This extremely hard and resistant formation provides a well defined floor under the clay deposit. For practical mining purposes, no better working surface could be provided than the hard Mowry shale.

Deposits Strip Easily

The upper contact of the clay bed with the black shales of the Frontier formation is sharply defined. The Frontier formation is soft and friable and can be readily removed without use of drilling equipment or dynamite. In certain localities the formerly overlying Frontier shales have been stripped during Tertiary erosion. In such areas, Tertiary gravels and sands may lie in direct contact with the Mowry shale, indicating that the bentonites have been stripped away. In other localities the Frontier has been cleanly stripped from the surface of the bentonite bed, leaving a smooth, rounded cream to buff yellow and crumbly bentonite clay surface.

The attitude (angle of dip) of the bentonite seams has been described in the preceding section on geologic occurrence. Angle of dip of the clay bed relative to the amount of overburden and the degree of dissection of that overlying unit is a controlling

factor in evaluating the economic limits of mining.

It has been previously stated that an 8:1 ratio of thickness of overburden to the thickness of the bentonite is considered to be the maximum for mining in this area. Therefore, a mathematical relationship between the dip in each area and the amount of overburden to be removed in that locality can be established. A distance down dip from the exposure of the clay, to which point it is economical to mine by open cut methods, can be established for each locality along the outcrop of the clay. Having established the breadth of the zone of profitable stripping of overlying black shales, it is then possible to compute the volume of clay available within the zone behind the outcrop.

In many places the bentonite bed is exposed with little or no overburden. In other localities the same bed protrudes as an outcrop trace at the base of a thick bank or cliff of Frontier shale. An evaluation of reserves requires that each locality be appraised in respect to the amount of overburden to be removed, the economic limits of stripping, and the quality as determined by sampling.

For a bentonite clay averaging 2 ft of thickness and applying an 8:1 ratio for stripping, the bed may be mined to a point defined by a line beyond which the overburden would be over 16 ft in thickness, providing the quality and grade is maintained.

A volumetric determination can be made by measuring the length of outcrop to which this relationship applies and multiply by the breadth and thickness of the strippable clay. A volumetric conversion of 22 cubic ft per ton is used throughout the bentonite industry in Wyoming.

Mining Practice

Standard mine valuation practice applies the terms "proven ore," "probable ore" and "possible ore." As used here, the tonnage "proven" is based upon a visible and uniform thickness of "x" feet of clay over an area considered by computation and judgment to be within the minimum limits of economic stripping.

"Probable" tonnage includes certain areas where the clay is expected to exist and should be profitably mined, but where the outcrop is partially obscured or otherwise questioned in quality or volume.

"Possible" tonnage includes that clay underlying excessive thicknesses of overburden or that underlying the overburden where by geologic interpretation the overburden is expected to be thin but the bentonite is nowhere exposed.

A "possible" tonnage may be considered as mineable after extensive mining operations have established the economic limits for the development of each individual locality. Quality and price of the clay and the established costs of mining will control the development of "possible" clay.

Preparation of bentonite clay for the clay industry is a relatively simple grinding, drying, and packaging circuit. Representative bentonite processing circuits are notably lacking in the literature; therefore, diagrams of mills of various sizes are presented.

Of all commercial materials, bentonite probably is the most susceptible to the effects of wetting on the outcrop and in the stockpile. The most successful operators find it desirable to lay out a stockpile and floor plan which will accommodate stockpiling from truck and railroad car deliveries. A mill floor plan, including a relatively large covered stockpile within the building has many advantages. During dry weather, direct truck loading to the inside stockpile provides a backlog of operating reserve which may be used during wet weather. During dry weather, the well-arranged mill may load from an outside pile to the bin at the head of the mill circuit. Loading of this bin from the interior stock may be handled by drag line.

Milling Is Simple

Clay from the bin is fed through a slicer-feeder to the primary crushing unit which may be differential rolls or a slicer. The product of the primary crush is then fed by belt conveyor to furnace oil-fired cylindrical dryers. Attrition during the drying period further reduces the clay aggregate and reduces the moisture content to under 8%. Screw or belt conveyors commonly handle the dried product, carrying it to silo bins as storage reserve for the fine grinding stage.

Raymond roller mills are commonly used in the industry to pulverize the dried clay. Cyclone dust collectors extract the minus 200-mesh product from the Raymond mill, depositing it in a product bin. Screw conveyors have been found the most satisfactory mode of transport between the product bin and the St. Regis or other type bagging machine, where the final product is packaged for shipping to bentonite users.

Since the bagging process is partially a manual operation, the well designed mill places the bagging unit within a few feet of the railroad siding loading platform. Bags are transferred on a flex-conveyor from the bagging location directly to the railroad car. Facilities are also provided for bulk loading of cars by screw or belt conveyor from the product bin, overhead to a spout loader, usually suspended above the railroad siding.

A vacuum dust collection system is a must in all bentonite mills. Dust pickups are usually placed as rigid or canvas tubes at all free points of the exposure of the dried product wherever they occur in the mill. These include the discharge end of the dryer, all belt transfer points, all bin transfer points, and the spout assembly at the bagging machine. Dust is returned by the vacuum system to the product storage bin or to the bagging bin.

Controlling Product Quality

Laboratory analyses are required in order to place a bentonite in its proper category of application:

1. Drilling mud
2. Foundry bonding
3. Cosmetics, medicinal
4. Filter bed, sewage disposal
5. Bleaching agent, decolorizor
6. Seals of earthwork ditches
7. Emulsifier, sprays and insecticides
8. Ceramics

Each of the above applications utilizes one or more of the properties of bentonite as the predominant characteristic. Certain bentonites may be ideal for one application and useless or uneconomical for other purposes because of variation in properties.

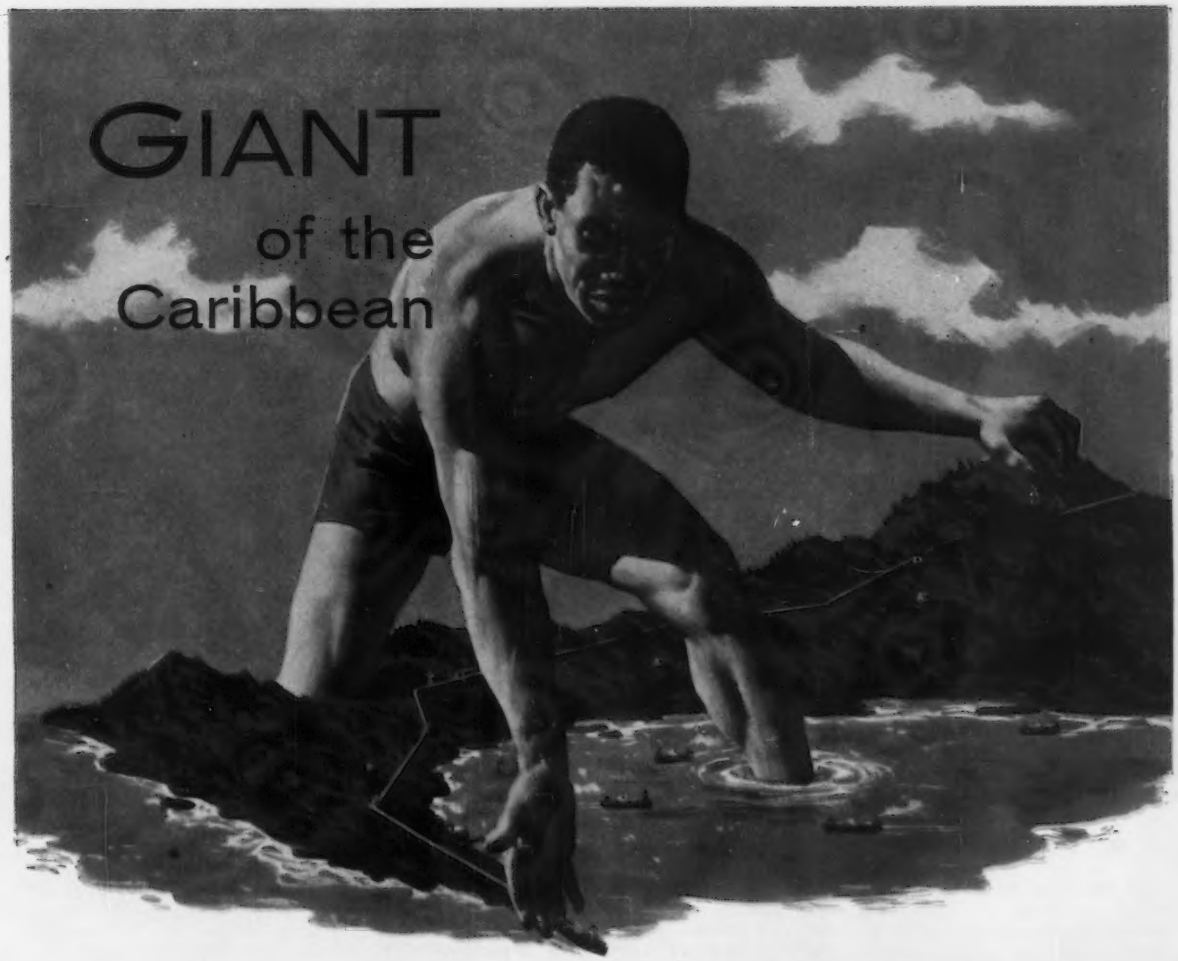
For reasons outlined below, a rigid specification list for each of these uses is generally not practical. The individual user, in common practice, accepts or rejects a particular bentonite according to its suitability for his particular use and treatment after direct application tests.

In some instances, a product with characteristics inferior to standard utility grades is acceptable to industry because of more favorable economics. A low colloid bentonite may, for example, substitute for a more expensive high colloid clay through the profitable use of larger quantities at lower total cost. Less costly foundry grade clay may be substituted for other clays in practice where low grade clays, plus additives, yield better results than the unadulterated clay.

Laboratory analyses may be used for the evaluation of the adaptability of any bentonite. The following listed characteristics are commonly determined by laboratory test:

Grit determination
Colloidally subdivided material
Viscosity
Gel strength
Wall-building test
Green and dry bonding power
Bleaching tests.

CONVEYOR BELTS



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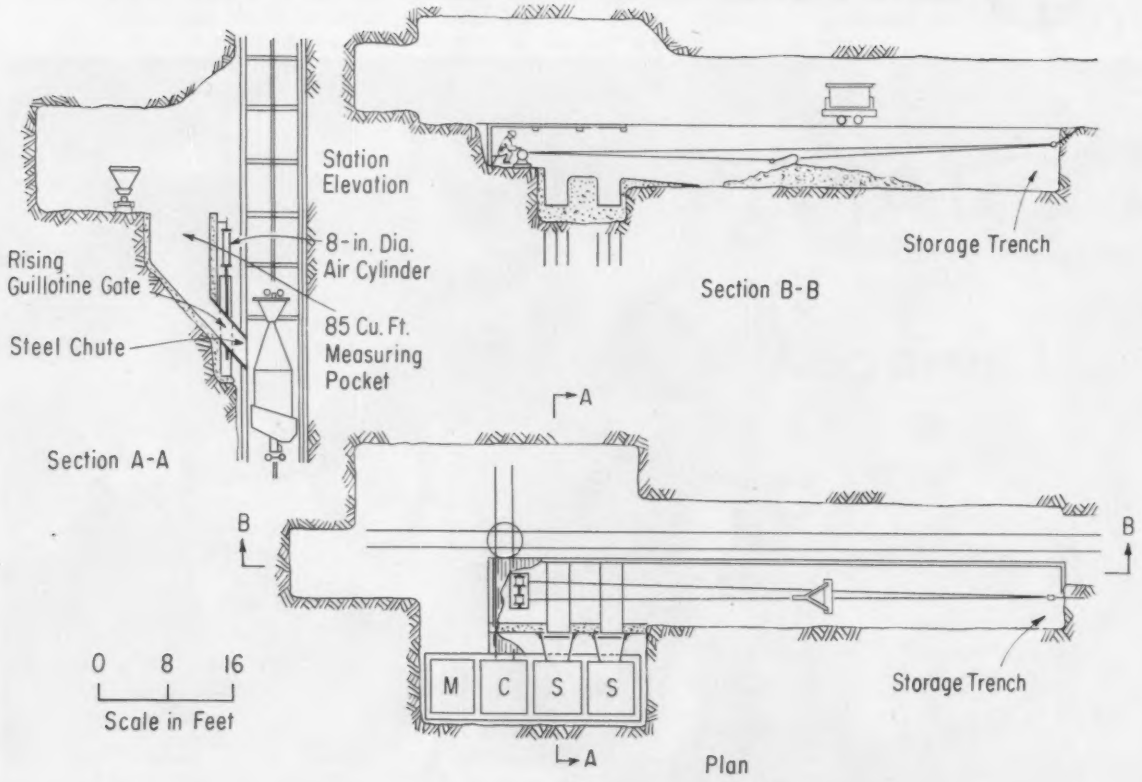
OPERATING IDEAS



Scraper Trenches at Stations Ease Underground Skip Loading

A. W. T. FREAKES

SKIP LOADING from skip-size pockets which are filled by scraping from a storage trench cut into the floor of the shaft station has proved economical in mining development stages and, in some cases, the best permanent ore handling system. Advantages of the method (now in use at Campbell Chibougamau Mines, Ltd., Quebec, Can.) are: 1) Elimination of car hoisting in development period; 2) can be ready immediately following shaft sinking; 3) for uncertain tonnage, first cost is less than level-to-level ore pass raises; 4) half the cost is in scraper hoist and hoe with 100% salvage when level is finished; and 5) coarse muck can be broken in trench away from shaft and stations.

System's disadvantages are that: 1) it cannot be used with underground crushing system; and 2) alternate ore and waste handling or ore classification is not as easy as in car hoisting.

When station is cut during shaft sinking operations and before permanent timer is installed, station floor is stepped down 6x7 ft back from the wall plate. A second and sloping cut is made at the bottom of this step, conforming as nearly as possible to the outline of the skip load measuring pocket. Slope of cut bottom should be 55 deg—at this angle muck will clear readily into the skip at loading time. The step is then extended as a trench to side of station and continued along drift side. It is preferable that the drift take off from the station on the side rather than at the back. Track centerline should be 11.5 ft plus ½ track gage from the shaft wall plate. This then provides for a 6-ft trench plus a curb along track edge against which side dumping cars are tipped. The trench can be carried any length depending on desired storage capacity. As long as the cut is carried well out of the station, extensions can be made later without damage to shaft installations but the first cut should accommodate two drift rounds.

As shaft sinking proceeds to lower levels, forms can be placed and concrete poured for the bottoms and sides and divider of the two measuring pockets and the air lifts installed. A rising guillotine gate gives the best result with positive protection against faulty closing and spills when measuring pocket is loaded beyond skip capacity. At Campbell, they found that extra size (8-in. dia) in gate cylinder added punch and sharp cutoff to gate when closing and opening.

Size of scraper hoist and scraper can be selected to fit each case. The pull is short and power or air consumption is a small item. There is ample time while skips are traveling for the loader to scrape in the next skip load, consequently hoist and hoe can be kept on the small side. A 15 hp electric or 18 hp air tugger moving a 42 in. hoe will keep pace with hoisting at 75 to 100 tph. Smaller installations using a 7½ hp scraper hoist will handle lighter hoes but can be operated in the lowest available gear for a short pull with maximum load.

Operational maintenance cost on the hoist hoe and cables must be balanced against control gates and raise repairs. Where the life of each level is in doubt, there can be a great investment saving with this method. Even when tonnage and life are great, there are circumstances favoring the trench, particularly if ore pass raises must be lined to combat erosion by falling ore with the dilution that results from wear and caving in the ore passes.

Costs of the trench loading per level are: 1) 1 scraper hoist—15 hp electric, $2900; 2) 1 scraper hoe—40 in., $470; 3) 200 ft ⅝-in. rope, $36; 4) tail pulley, $40; 5) 2 guillotine gates with air cylinders, $1,600; 6) concrete and forms (est. @ $50 per yd, $500; 7) excavation for 35 ft trench 6x7 ft, $800; 8) labor, installation, $500. Total, $6,846.

Mr. Freakes is a mining engineer, 55 Liberty Street, New York 5, N. Y.

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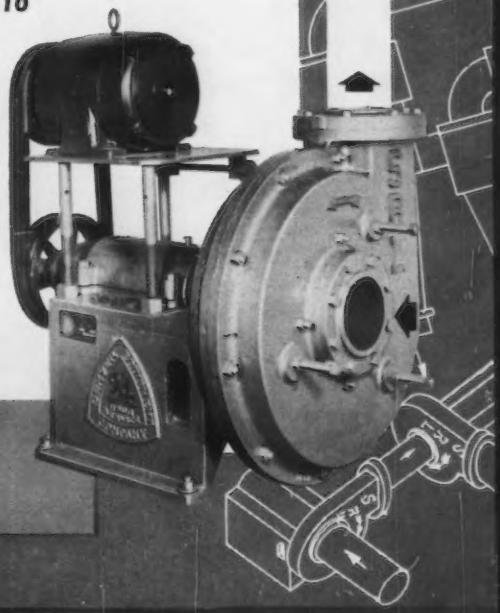

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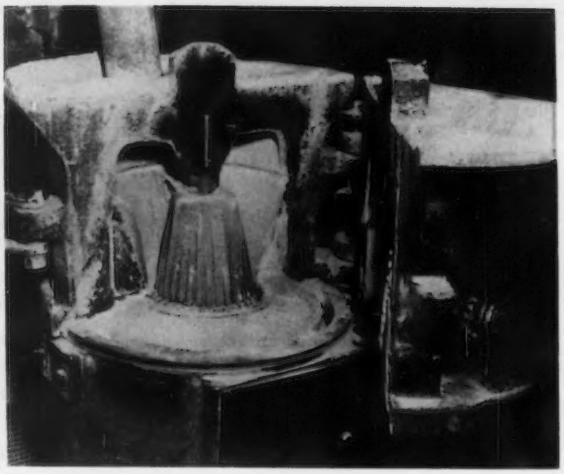
OPERATING IDEAS *(Continued)*

Coal Unit Now Grinds Phosphates



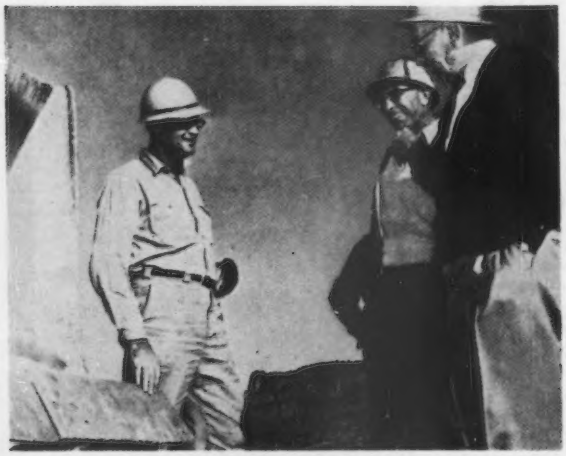
ACCURATE SAMPLING of sodium phosphates is being carried out by two automatic coal samplers at Westvaco Mineral Products Div., Carteret, N. J.

The samplers, originally made for the mining industry by Sturtevant Mill Co. of Boston, Mass, have, according to Westvaco officials, performed their jobs for six years with no downtime and no parts replacement.

Operating on approximately three hp, the Sturtevants run at 160 rpm without vibration. Their wearing parts (crushing nut and top crushing liners) can be replaced easily and inexpensively when needed. Phosphates are fed into a hopper where they are gripped by a revolving coarse crushing nut and roughly crushed against the top of the liners. They are then gravity-passed to a revolving, fine-toothed crushing disc and stationary liner where the crushing operation is completed.

Only a fraction of Westvaco's product stream is directed to the samplers. Of this, a 10% increment is diverted to sample cans for laboratory analysis. When the 10% sample is discharged at the periphery of the rotating disc, the balance of the fine-ground phosphates are passed back into the product stream through a larger, inclined spout.

A handwheel adjustment at unit's lower body allows adjustment for fine or coarse grinding. It's turned until the crushing nuts strike the stationary grinding liners. When phosphates are fed into the sampler and normal operations begin, the grinding nuts center themselves for the fine grind and operate without striking the liners.



Dozer Plates Cut Cleaning Time

ADDING METAL cornerplates to dozer blades has greatly eased the cleaning of rock from under long ties which support trolley poles over the dump tracks at Kennecott Copper Corp.'s Chino Mines Division, Santa Rita, New Mexico.

The unit, devised by A. L. Bateman, bulldozer operator, cuts cost and time on this task which was formerly done by hand shoveling.

Soft Wood Plug Eases Blasting

BLASTING COSTS can be greatly cut by using a soft wood stemming plug, according to the International Trublast Stemming Corp. (Pty) Ltd., Johannesburg, South Africa.

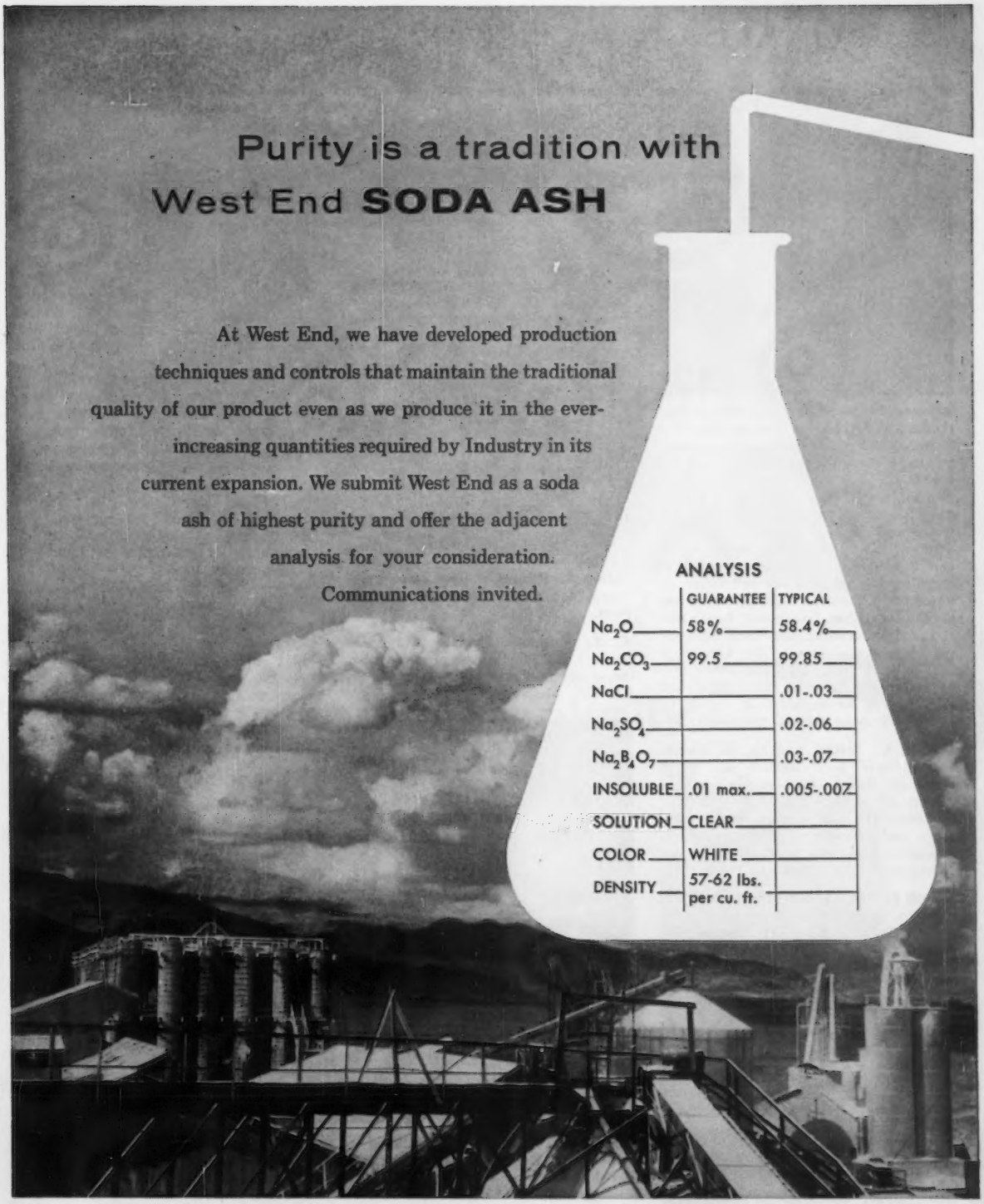
Company representatives stated that their Trublast Rapid Stemming Plug will disintegrate at the moment of explosion—forming a perfect drill hole seal.

The cost reduction (International Trublast claims a 30 to 40% savings) is obtained by: (1) reducing the length and number of drill holes needed; (2) reducing the quantity of dynamite needed; (3) reducing stemming operation time; (4) increasing surface removal; (5) giving greater fragmentation; and (6) offering easy removal in case of misfires.

After dynamite has been inserted into the drill hole, lay fuse in plug groove and attach fuse detonator to top stick of dynamite. (Rounded end of the Trublast plug should face the charge.) Then start the wedge action by splitting the plug. Pulling on the fuse will check the wedge action. Soft wood plugs were tested at Anglo-Transvaal Consolidated Inv. Co. Ltd., where it was compared with sand and clay plugs. Trublast officials said plug gave advance per machine of 3.2 to 3.7 ft and increased holes per machine shift from 22 to 27.

Tests showed that the percentage improvement of clay plugs with sand tamping was: yards per machine shift, 16%; holes per yard, 7%; and yards per case explosives, 9%. Using the soft wood plug, the results were: yards per machine shift, 42%; holes per 2 yards, 36%; and yards per case explosives, 28%.

On a stoping test, the company reported that the plug showed a percentage improvement over sand by: yards per machine shift, 29%; holes per 2 yards, 12%; and yards per case explosives, 3%.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PERSONALS

Alfonzo Zuzunaga, left, and **Miguel Carrizales,** recipients of scholarships for postgraduate work in mining awarded by the Cerro de Pasco Corp., visited *E&MJ's* offices recently on their return trip to Peru. During the past year they have completed an intensive English language orientation course for foreign students at the Colorado School of Mines, and a postgraduate course in mining at the Montana School of Mines. Cerro de Pasco Corp.'s stipend included round-trip air transportation, full tuition, books and a liberal maintenance allowance. Both engineers are graduates of the University of San Marcos, Lima, Peru, oldest university in the Western Hemisphere and have served as foremen in Cerro de Pasco's Peruvian mining operations.

Donald C. Tretzel and **D. G. Farquharson** have been elected vice presidents of Kaiser Bauxite Co., wholly owned subsidiary of Kaiser Aluminum & Chemical Corp. Tretzel, works manager, and Farquharson, administrative manager, have been associated with the Jamaican bauxite operations since 1951.

Merrill E. Pratt, president of Continental Gin Co. since 1938, became the company's board chairman; **Eugene H. Brooks,** executive vice president, was elected president and chief executive officer. **Richard T. Dorsey** was made vice president.

A. E. Hermann is now superintendent-industrial relations for Oliver Iron Mining Division's Hibbing-Chisholm district.

Carl K. Lenz, president of Kennecott Copper Corp.'s subsidiary, Kennecott Sales Corp., was elected to the board of directors. At Kennecott's Utah Copper division, **Frederick C. Green** was appointed general manager, succeeding **L. Fern Pett,** who retired April 30. Succeeding Green as assistant general manager is **Ira K. Hearn Jr.,** formerly chief industrial engineer of the company's Western mining divisions.

Lenz

Travis P. Lane has joined the Arizona Department of Mineral Resources, with offices at Phoenix.

John C. Hagen, geologist for Ozark Ore Co., Mo., has been assigned by M. A. Hanna Co. to St. John d'el Rey Mining Co. to investigate with other engineers St. John's gold and iron ore resources in Brazil.

R. P. Riggin has been appointed director of industrial relations for Noranda Mines Ltd. and its subsidiaries.

Roy J. Henry and **J. L. Gray** were named presidents of Eldorado Mining & Refining Co. and Atomic Energy of Canada Ltd., respectively. Henry, vice president since 1953, previously had been manager of Eldorado's Beaverlodge operation and technical assistant to the president. Gray has been vice president, administration and operations of AECL since January 1954.

S. G. Farrar, of Toronto, was made assistant to managing director and secretary of Canadian Metal Mining Association.

Dalton L. Russell is now plant metallurgist for Cerro de Pasco Corp. in Peru.

R. T. Sheppard, formerly with Geco Mines Ltd., Manitouwadge, has joined the exploration staff of Broken Hill Pty. Co. Ltd., Melbourne, Australia.

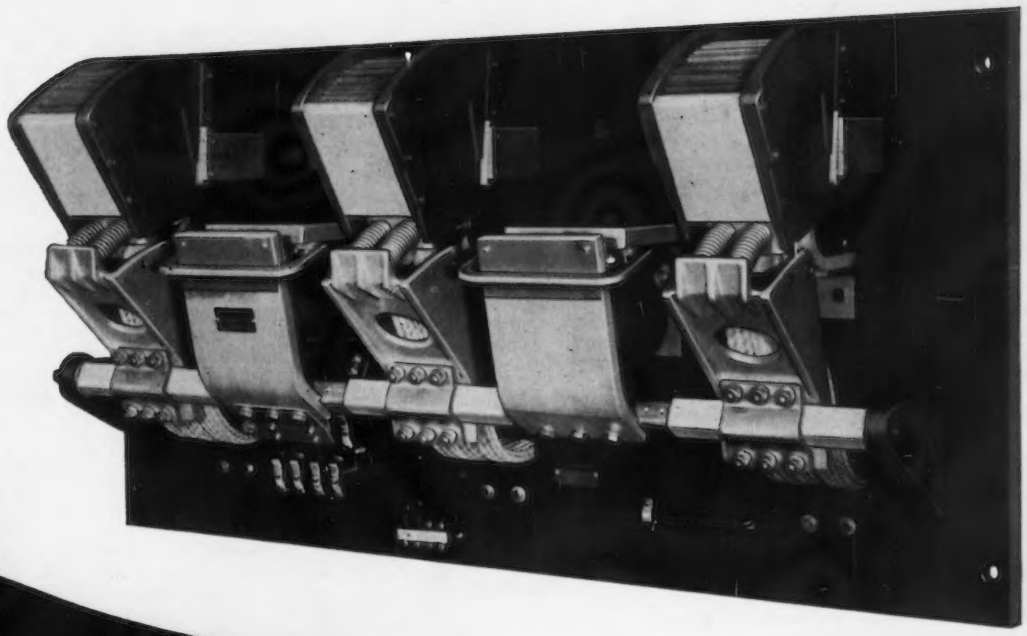
Thomas M. Ware, former administrative vice president of International Minerals & Chemical Corp. was elected president. At 39, he is the fifth and youngest president of the 50-year old corporation. He succeeds his father, **Louis Ware,** who was elected chairman of the board and chief executive officer. Since joining IMC in 1947 the new president directed construction of new plant facilities and installations and as vice president of engineering planned, coordinated and directed a program that streamlined methods in IMC's 72 mines and plants. Since 1955, as administrative vice president, he has centralized and broadened the corporation's staff services. In 1957 he was elected to the board of directors and has had the additional responsibilities of the executive vice president since the retirement of James P. Margeson last June.

Ware

Frederick A. Dudderar has been made general superintendent of U. S. Steel Corp.'s Clairton Works, succeeding **David P. Finney,** retired. **Edward N. Nibbert** was named assistant general superintendent.

Edward A. Prentis (center) is shown receiving the 1958 Alexander Hamilton Medal from Aaron W. Berg, president of Columbia College Alumni Association, at a dinner in Low Memorial Library on the Columbia campus, April 20. Mr. Prentis, partner of Spencer, White and Prentis, a New York engineering firm, and a Columbia University School of Mines graduate mining engineer, class of 1906, received in 1950 the Columbia Engineering School's Egleston Medal "for distinguished engineering achievement," thereby becoming the first man to hold both of these awards.

Admiral Ben Moreell (right), guest speaker and chairman of Jones & Laughlin Steel Corp., was also a recipient at a ceremony in Chicago, May 9, of the Washington Award, the engineering profession's highest honor, presented by the Western Society of Engineers on recommendation of commissions representing the ASCE, the AIEE, AIME, and the ASME. Mr. Moreell, who retired from active naval service in 1946, was organizer of the Navy "Seabees" in World War II, and is the only non-Annapolis man ever to attain the permanent rank of admiral.



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*7th meaning, Webster's New Collegiate Dictionary, Second Edition.

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ALLIS-CHALMERS

PERSONALS *(Continued)*

Dr. Raymond E. Vener has been appointed manager of industrial research of M. W. Kellogg Co. New York, a subsidiary of Pullman Inc. Well known for his accomplishments in process engineering, particularly in the atomic energy field, Dr. Vener was a research assistant on the Manhattan Project, chemical engineering professor at Drexel Institute, and for the last seven years with Catalytic Construction Co., engaged in process design, research, sales and technical publications.

Vener

R. E. Whitney, Cleveland, vice president of M. A. Hanna Co., has been named Lake Superior District chairman for the 1958 Metal Mining and Industrial Minerals convention of the American Mining Congress, San Francisco, Sept. 22-25.

R. W. Summey, recently elected a director of Noranda Copper & Brass Ltd., continues as vice president and general manager.

James A. Pike, B. C. manager of Newmont Mining Corp. of Canada Ltd., has been elected president of British Columbia and Yukon Chamber of Mines for 1958.

A. B. MacLaren has been made a director of Mufulira Copper Mines Ltd.

L. T. Postle, president of Granby Consolidated Mining, Smelting & Power Co. Ltd., has been re-elected president of Mining Association of British Columbia.

Murray W. Stowell has been appointed general manager of Broken Hill South Ltd.

Hans A. Vogelstein president of American Metal Climax Inc., has been appointed a director of Rhodesian Selection Trust Ltd.

Richard N. Hunt, vice president and chief geologist for United States Smelting & Refining Co., has retired, but will continue as a director, and also on the board of Hecla Mining Co. Succeeding him is **Ralph Tuck,** assistant chief geologist who has been designated chief geologist-western operations. Tuck joined USSR&M at Fairbanks, Alaska in 1937, transferring in 1939 to western operations headquarters at Salt Lake City. Hunt, who was consulting engineer with Horace B. Winchell in 1922, was a part time geologist for USSR&M from 1922-29, and became chief geologist in 1938 and in 1952 a vice president and a member of the board. He will continue to live in Salt Lake City.

F. H. Cash, Duluth, district manager for Republic Steel's Minnesota and Michigan iron mines, has retired after nearly 50 years' service. He will continue as a consultant.

Albert Hopkins has recently formed Hopkins Mining Consultants Ltd., Toronto. Vice president is **I. V. Dellio,** secretary-treasurer **H. C. Washburn,** chief geophysicist **Ralph Hutchison,** and chief engineer **Fred Dunn.**

Anthony Lane has been appointed manager of Yucca Mining Corp. and Florida Manganese Inc., Luna County, N.M. Lane was formerly with Alpine Laboratories Ltd., Colorado, owned Lane Engineering & Research Co., Deming, N.M., and was at one time personal consultant to Carl Loeb Jr. of New York, owner and president of Yucca mines.

A. C. Borgeson, chief mining engineer of Shenango Furnace Co. and Snyder Mining Co., retired May 10 after 47 years' service. An AIME member, he was vice chairman of the Minnesota section in 1957, and chairman of the Mining sub-section, 1956.

(Continued on p 161)

OBITUARIES

Kenneth T. Price, *55,* vice president in charge of Louisiana producing operations of Freeport Sulphur Co., died May 13 at the Port Sulphur Hospital (La.) following a heart attack. Mr. Price had lived in Port Sulphur since 1934. He joined Freeport as an engineer upon graduation from the University of Texas in 1925. In 1930 he became superintendent of scouting and in 1934 was transferred as superintendent of production at Freeport's first Louisiana mine. He was appointed general superintendent of that property in 1942. Mr. Price became assistant vice president in 1951 and was elected vice president in July 1952. He was a member of the AIME, the Louisiana Engineering Society and the Petroleum Club of New Orleans.

Price

Paul M. Elliott, *55,* outstanding ore dressing metallurgist at Cominco died suddenly in Kimberley, B. C., April 10. He was graduated from Nova Scotia Technical College in 1923 as a mining engineer. He joined Cominco in 1925 as an assayer at Kimberley and served as mill superintendent at many operations. At Trail in 1943, he assisted in supervision of milling for several operations, returning to Kimberley in 1949 to work on development and technical control for the Sullivan concentrator. He became operating superintendent in 1956 and superintendent on Feb. 1 of this year. Mr. Elliott was a member of CIM and the Association of Professional Engineers of B. C.

Manfred T. Hoster, 72, mining engineer long with E. & G. Brooke Iron Co., of Birdsboro, Pa., died June 10 at his boyhood home, E. Rutherford, N. J. More recently he had been with the Colorado Fuel & Iron Co., which had taken over E. & G. Brooke Co., for whom he was acting as consulting engineer for Richard Ore Co., Dover, N. J. He was a graduate of the School of Mines, Columbia University class of 1908.

Hoster

William Hunt Eisenman, 73, secretary and a founder-member of the American Society for Metals, died May 30 in a LaJolla, California, hospital.

Evert William Myers, *55,* traffic manager in the general office of Anaconda Reduction Works, Butte, died May 23.

E. M. Norris, *75,* former assistant general superintendent of mines, Butte, and retired manager of Anaconda's Conda (Idaho) phosphate operations, died May 7 at his home in Chula Vista, Calif.

David L. Martin, 84, prospector for U. S. Smelting Co. and a gold miner for 50 yr, died Apr. 25 in Salisbury, N. C. He was owner of the Southern Gold and Copper mine at Gold Hill.

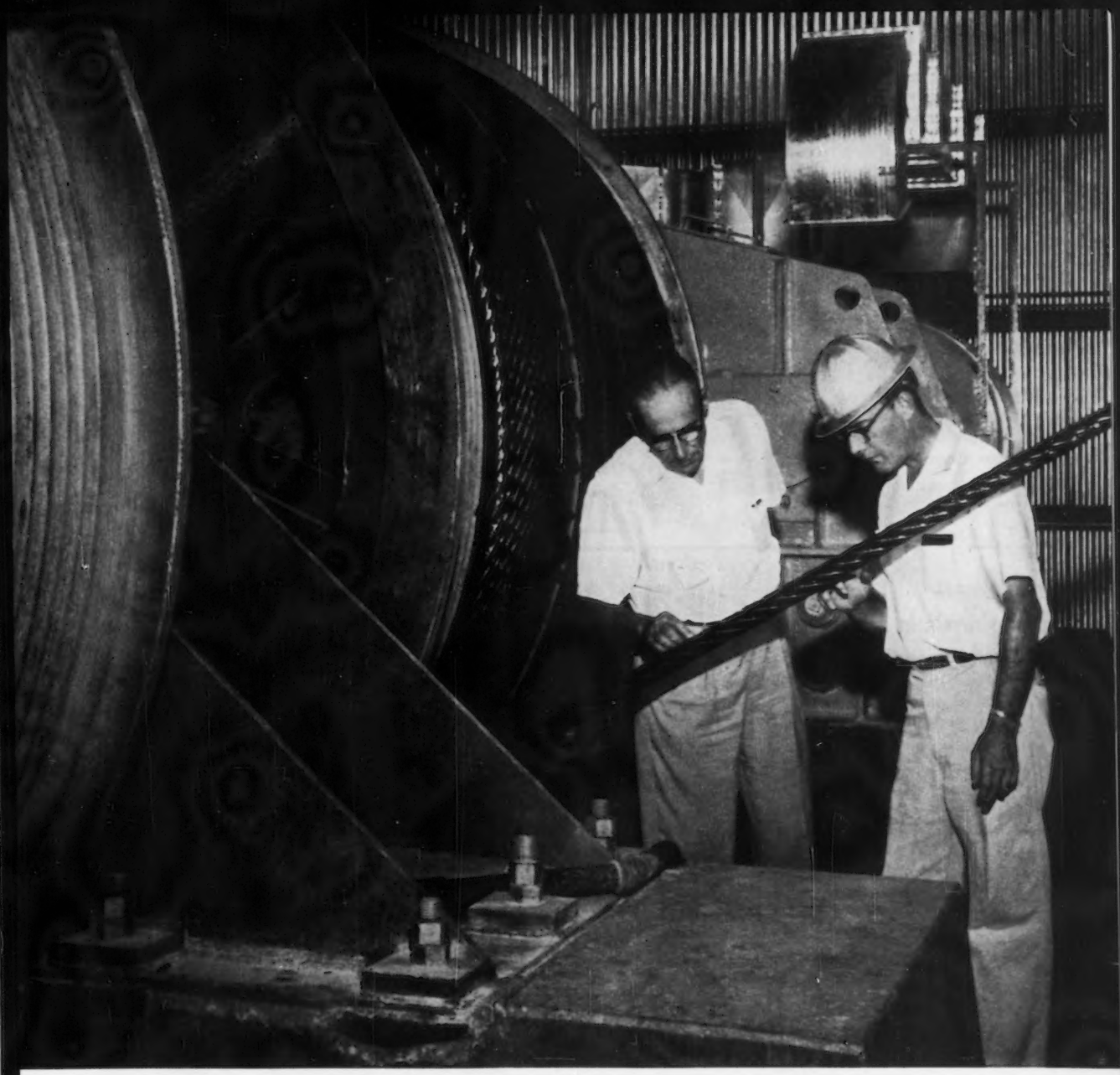
Gust Weggum, 77, retired mechanical superintendent of M. A. Hanna's Mesabi range mines, died Mar. 22, Nashwauk, Minn. The Weggum mine (Hibbing) was named in his honor.

Harry T. Hulst, 82, chief engineer for Oliver Iron Mining Co. on the Marquette range until his retirement in 1934, died Mar. 27, in Ishpeming, Mich.

William Owen Bullock, 71, former personnel manager at Asarco's Murray, Utah, lead-zinc reduction plant and for many years superintendent of Toplift quarry and later mill foreman at the Murray plant, died May 7, at Houston, Tex.

John E. Hammell, 82, Canadian mining pioneer, died at his Oakville, Ont. home in early May. Known particularly for his role in the development of Flin Flon mine in northern Manitoba which became the Hudson Bay Mining & Smelting Co., and for the opening up of the Howey at Red Lake and later the Pickle Crow, Mr. Hammell also figured prominently in putting commercial aviation on a paying basis in Canada in fathering the bush pilot through his famed Northern Aerial Minerals Exploration Ltd. He was president for many years of the Howey Gold Mines, which he had promoted, and also developed the Hasaga and Starratt Olsen at the Red Lake camp.

(Continued on p 164)



Healthy after the first million tons. This is the hoist house at Pima Mine, near Tucson, Arizona—first southwestern mine to use skip hoists for open-pit operations. Because of the steep pitch of the ore body (45 degrees), the Pima management decided that skips would be more economical than conventional open-pit methods.

Two skip cars working in balance haul copper sulfide ores and waste to the top of the pit. Each of the cars weighs 15 tons and is capable of handling 22 tons of ore, dirt, and rock. Pitch of the skipway is a steep 38 degrees. Both drums of the hoist are rigged with Bethlehem wire rope, 1⅞-in. Purple Strand, 6 x 25 W. The photograph above shows one of these ropes under inspection, after the system had lifted its first million tons. The rope and its twin were both found in excellent condition, ready to start work on the second million.

Bethlehem Steel Company, Bethlehem, Pa. On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

Mill depots and distributors from coast to coast stock Bethlehem rope for the following industries and numerous others:

MINING • QUARRYING • CONSTRUCTION • EXCAVATING • PETROLEUM • LOGGING • MANUFACTURING

BETHLEHEM WIRE ROPE
BETHLEHEM STEEL

fastest growing acceptance in

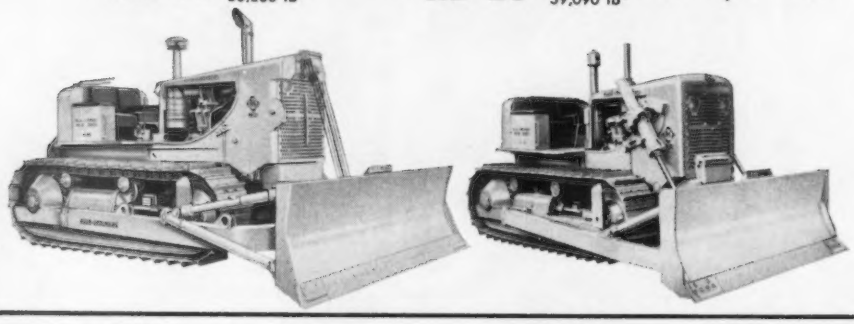
Allis-Chalmers crawler tractors for every application

...plus a complete line of matched bulldozers, side booms, mounted rippers, other attachments.

*All weights approximately as illustrated. Twelve other tractor models available.

HD-21 225 net engine hp, torque converter drive, 56,260 lb*

HD-16 torque converter drive, 150 net engine hp, 39,090 lb* | all-gear drive, 141 belt hp

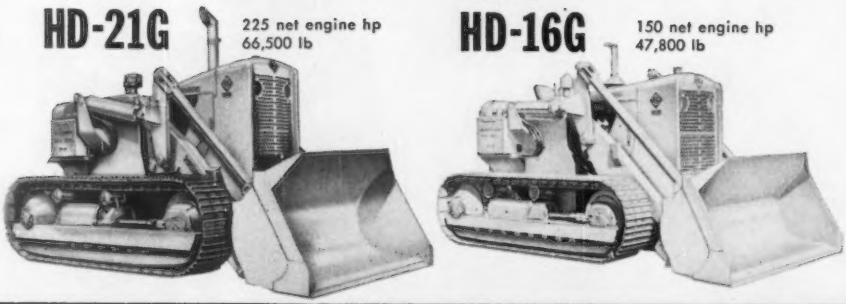


Allis-Chalmers tractor shovels in a full range of bucket sizes...

up to 7-cu-yd capacity to match requirements for various materials and job conditions.

4-CU-YD
HD-21G 225 net engine hp, 66,500 lb

3-CU-YD
HD-16G 150 net engine hp, 47,800 lb



Allis-Chalmers motor scrapers and wagons...

five models that offer major advantages on big jobs or utility work.

TS-360
280 hp
Struck — 15 yd
Heaped — 20 yd

TW-360
280 hp
Struck — 17 yd
Heaped — 24 yd

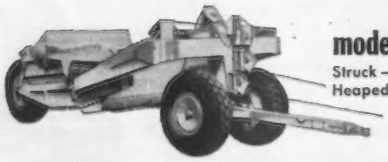
TR-260
200 hp
Struck — 11 yd
Heaped — 15 yd

Allis-Chalmers pull-type scrapers...

the only line with low bowl, high apron lift, forced ejection in every size.

model 315
Struck — 15 yd; Heaped — 20 yd

model 108
Struck — 8.4 yd
Heaped — 12 yd

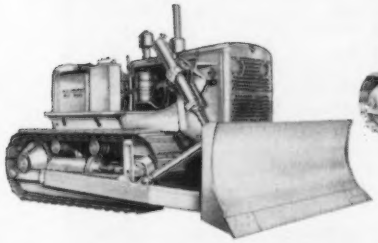


model 106
Struck — 6.1 yd
Heaped — 8.5 yd

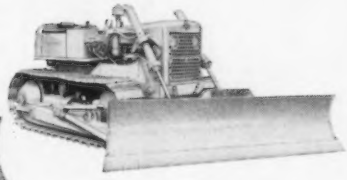
model 44
Struck — 4 yd
Heaped — 5.5 yd

the business . . . ALLIS-CHALMERS CONSTRUCTION MACHINERY

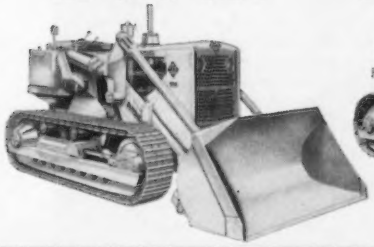
HD-11 94 belt hp 25,960 lb*



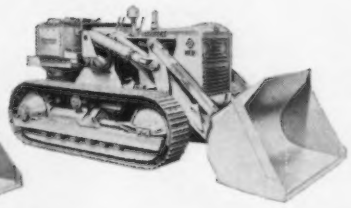
HD-6 63 belt hp 16,470 lb*

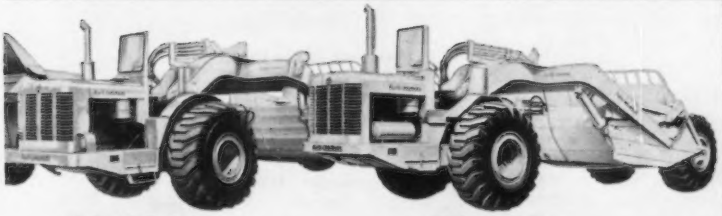


2¼-CU-YD
HD-11G 111 net engine hp 32,000 lb



1½-CU-YD
HD-6G 72 net engine hp 19,600 lb



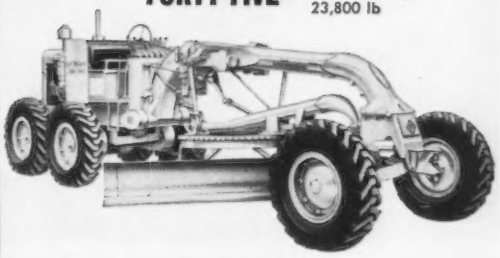


TS-260
200 hp
Struck — 11 yd
Heaped — 14 yd

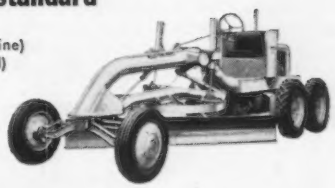
TS-160
155 hp
Struck — 7 yd
Heaped — 9½ yd

Allis-Chalmers motor graders...
designed for comfort-conscious operators and cost-conscious owners.

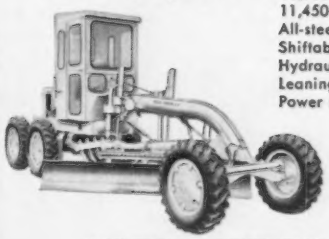
FORTY-FIVE 120 brake hp 23,800 lb



model D standard
50 brake hp
8,800 lb (gasoline)
9,350 lb (diesel)



model D special
50 brake hp
10,900 lb (gasoline)
11,450 lb (diesel)
All-steel cab
Shiftable moldboard
Hydraulic scarifier
Leaning front wheels
Power circle turn



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MILWAUKEE 1, WISCONSIN

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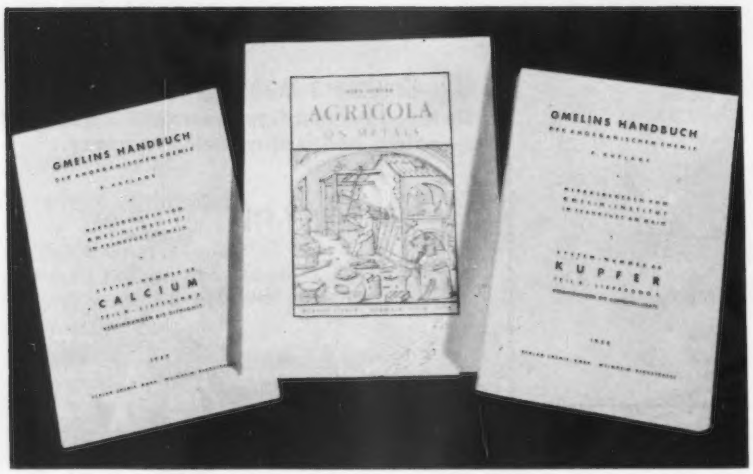
Look ahead... *move ahead*...and stay ahead with ALLIS-CHALMERS

NEW BOOKS

Agricola on Metals, and Gmelin Handbooks



Gmelin's Handbuch der Anorganischen Chemie. 8 Auflage. System Nummer 28 —Calcium, Teil B, Lieferung 2, verbindungen bis dithionit. Following material on the hydrides, the volume deals with the oxides, hydroxides, peroxides, nitrides, azides, imides and amides. Then the Ca-NH_3 system, the compound $Ca(NH_3)_6$, and the salts of the oxygen acids of nitrogen, as well as the corresponding addition compounds, and the basic salts, CaF and CaCl, are included. Published by Verlag Chemie, Gmbh, Weinheim/ Bergstr., West Germany. Gmelin handbooks may be obtained in the U.S. through Walter J. Johnson, Inc., 111 5th Ave., New York, N. Y. or through Stechert-Hafner, Inc. 31 East 10 St., New York 3, N. Y. Text is in German. 391 pp. Price $52.56.

Agricola on Metals, by Bern Dibner. An interesting study of the metal and mineral mining and processing techniques as described by Agricola. Most of Agricola's original 291 woodcuts are repeated. Published by Brundy Library, Norwalk, Conn. Illustrated in 128pp. Price $2.50.

Gmelin's Handbuch der Anorganischen Chemie. 8 Auflage. System Nummer 60 —Kupfer, Teil B, Lieferung 1, verbindungen bis kupfertellurate. Material is presented on the hydrides, oxygen compounds, nitrogen, halogens, sulphur, selenium and tellurium salts. Most of the compounds in this volume are naturally occurring minerals. Published by Verlag Chemie, address above. Text is in German. 624pp. Price $83.76.

Gmelin's Handbuch der Anorganischen Chemie. 8 Auflage. Systematik der Sachverhalte. Classification of subject matter in inorganic chemistry and related fields with code numbers for machine documentation systems. Text is in both German and English. Published by Verlag Chemie, address above. 116pp. Price $17.28.

Books and Pamphlets

Pump Operation and Maintenance, by Tyler G. Hicks. How to operate and maintain all kinds of pumps. Well illustrated. Published by McGraw-Hill Book Co., 330 West 42 St., New York 36, N. Y. 275pp. Price $9.

Ion Exchange Resins, by Robert Kunin. Second edition brought up to date to include the recent developments and applications. Permselective membranes, hydrometallurgy and specific exchange resins are discussed, along with liquid exchangers and the economics of ion exchange. Published by John Wiley & Sons, Inc., 440 4th Ave., New York 16, N. Y. 466pp. Price $11.

Memorandum Concerning Mining Possibilities in Peru, prepared by Mario Samame Boggio for the Decano de la Facultad de Mineris del Peru, Lima. Text is duplicated in Engilsh, French, German, Spanish and Italian. 68pp.

Electrons and Ions . . . Keys to Mineral Processing. A reprint of the 16-page article that appeared in April *E&MJ* is available, with the cover attached, for 50c a copy from the Reprints Editor, *Engineering & Mining Journal,* 330 West 42 St., New York 36, N. Y.

Bulletin No. 166. Acid Mine Drainage Problem in Ohio, edited by E. Moulton. Review of prior research. Some Federal-sealed mines examined. Bibliography of the problem. By Ohio State University, Columbus, Ohio. 160 pp. Price $2.

Atomic Energy Facts. A summary of Atomic Energy Commission and industry developments since the beginning of the program. Well illustrated to explain every aspect from production to fission and fusion confusion. Can be obtained from Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. 210 pp. Illustrated. Price $2.

BOOKS PRESENTED on this page may be obtained by writing directly to the publisher mentioned in each individual case. *E&MJ,* does not offer for sale any of these books unless specifically stated.

Bulletin No. 6. Central Wyoming Phosphate Rock—Character, Processing and Economics, by Walter E. Duncan and H. G. Fisk. Natural Resources Research Institute, University of Wyoming, Laramie, Wyo. 60 pp.

Motion Picture

The Atom Comes to Town, prepared by Chamber of Commerce of the U. S., Washington, D. C. Film is 16mm, sound, color and runs for 29 minutes. Can be rented for seven days at $15.

Yearbooks

1958 Canadian Trade Index. Includes the "how to" of export trade, companies, products, etc. Index is in French-English, German, Spanish, or Portuguese upon request. 1082pp.

Mining Yearbook 1958, compiled by W. E. Skinner. Lists 945 principal mines in the Free World, mining engineers and managers, world production, and buyers' guide. Published at 20, Copthall Ave., London, E. C. 2. 830pp. Price $7 post free.

1954 Minerals Yearbook, Vol. II, Fuels. Prepared by the U.S. Bureau of Mines. May be obtained from Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. 457pp. Price $2.25.

Annual Report, Department of Mines, 1957. Printed for the Province of Nova Scotia, Halifax. 200pp.

Transactions of the International Mineral Dressing Congress, Stockholm, 1957 are being published as *Progress in Mineral Dressing.* Contains 34 papers, many of which were abstracted in November *E&MJ,* 1957. Also includes 130 contributions to the discussion. Published by the Congress, Nackstromsgatan, 1 III, Stockholm C, Sweden. 750 pp. Price is $15 with Swedish, British, German or U.S. currency accepted.

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The Wemco-Fagergren Flotation Machine:

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The answer is not in creating bubbles—but in creating bubbles that work efficiently to recover maximum mineral values.

Wemco-Fagergren, more than ever, is a standard in the world's major operations. It consistently gives highest recovery per dollar spent.
It maintains a world-wide reputation for dependable production—under the toughest conditions.

The investment in Wemco-Fagergren Flotation machines is sound—wherever maximum production and recovery with low costs are vital factors of operation.

Depend on
Wemco-Fagergren Flotation
and the skills behind it

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WHAT'S NEW IN U.S. PATENTS

OLIVER S. NORTH

Mining

Improved method for blocking fire damp in mines producing coal or sulphides of iron or copper. A foaming material consisting of a resin foam agent and phosphoric or oxalic acid is sprayed simultaneously with a condensate of urea formaldehyde resin. Foam quickly hardens and clings to walls and other surroundings. W. Bauer. No. 2,835,330.

Metal and Mineral Processing

Magnetic separator for recovering values from weakly magnetic ores. Each extraction roller forms a pole of a magnet frame. Apparatus has about 50% higher capacity than most devices of this type. A. Goltz and K. Neumann, assigned to Erzbergbau Salzgitter Aktiengesellschaft. No. 2,832,471.

Design for an improved hydraulic ore concentrator. Accurate regulation of size and form of concentrate is maintained by means of a closely controlled secondary flow of water passing through the concentrating chamber. E. J. Pierce. No. 2,832,472.

Apparatus and method for treating hot sintered or agglomerated iron ores. T W. Plante. No. 2,832,584.

Design for a combination blast furnace and heater for smelting iron or other metal ores. H. Koppenberg and A. W. W. Wenzel, assigned to Ko-We Niederschachtofen Gmbh. No. 2,832,681.

Wet method for removing adherent alumina trihydrate scale from apparatus used in Bayer process production of alumina. Scale is dissolved by a caustic soda solution. N. Bell, P. P. Bellan Jr., and D. J. Donaldson, assigned to Kaiser Aluminum. No. 2,832,703.

Automatic control for wet grinding mills. Use is made of at least two electrical control signals, one of which is responsive to mill loading. Other is responsive to pulp viscosity and is used to regulate liquid feed rate. D. Weston and S. W. Daniel, said Daniel assigned to David Weston. No. 2,833,482.

Method of preparing metallurgical-grade alumina from phosphate-containing ammonium alum solution derived from acid digestion of the leached zone material overlying Florida pebble phosphate beds. D. H. Reeve, assigned to U.S. AEC. No. 2,833,621.

Fluidized process for calcining finely divided gamma alumina to produce alpha alumina. Hot gamma alumina from a first fluidized bed is subjected to action of a catalyst, for example AlF_3, in a catalytic conversion chamber. E. J. Roberts and W. W. Jukkola, assigned to Dorr-Oliver, Inc. No. 2,833,622.

Apparatus for continuous leaching of copper, zinc, aluminum ores. Separation of solids from liquid after each leaching step is not required, thereby greatly reducing leaching time. H. Loevenstein, assigned to Harvey Machine Co., Inc. No. 2,833,630.

Improved binder additive for use in pellitization of taconite of other ores consists of 65 to 95% bentonite and 5 to 35% alkaline soybean meal. Pellet strength is improved by use of this binder composition. N. G. Barker and R. Nordgren, assigned to General Mills, Inc. No. 2,833,642.

Construction and operation of an iron blast furnace whereby flue dust is recovered. L. L. Newman. No. 2,833,643.

Solid phase reduction of chromium oxides by carbon, and production of sintered shapes of low-carbon chromium metal. Ore-carbon pellets are heated to reduce gas evolution and then cooled, re-ground, re-pelletized and heated in a vacuum to obtain complete reduction. H. deW. Erasmus, assigned to Union Carbide Corp. No. 2,833,645.

Improved open-ended rotating drum for forming spherical pellets from pulverized ore. Resiliently-supported scraping members are provided for regulating thickness and roughness of the layer of material adhering to the inner wall of the drum. K. M. Haley, H. V. Trask and W. C. Larter, assigned to Oglebay, Norton & Co. No 2,834,043.

COPIES of U.S. patents can be purchased at 25c each from Commissioner of Patents, Washington 25, D. C.

Apparatus for delivering, to a vertical furnace having a rectangular mouth, a layer of moist and fragile pellets of ores, concentrates or the like. F. D. De Vaney and D. Beggs, assigned to Erie Mining Co. No. 2,834,484.

Improved wet ore crusher of the rotating shoe type. Energy requirement is low, and wear on parts is minimized due to an even and smooth rotation of parts. B. J. Pugh. No. 2,834,555.

Process for making briquettes from undried and pulverized ores, coals, or mixtures of ore and coal. Wet material is mixed with a molten polycyclic hydrocarbon pitch and the resultant homogenous mass dried and cooled. F. Eisenhut, V. Gobiet and A. Siegl, assigned to Gelsenkirchener. No. 2,834,660.

Titanium oxide is reduced to metal form by mixing it with magnesium metal and magnesium chloride, heating the mixture, and leaching the reaction mass with HC1. D. W. Rostron, assigned to Dominion Magnesium Ltd. No. 2,834,667.

Method for direct extraction of lead from mixed sulphide ores. Ore is melted along with sodium carbonate, sodium chloride, carbon, and one of the following oxides: zinc oxide, iron oxide, silica or lime. The required oxide or oxides will frequently be found in association with galena naturally. K. Pendar assigned to Sesam S. A. No. 2,834,669.

Process for producing metallic molybdenum. Ore is heated with tin under non-oxidizing conditions at a temperature of about 1200 deg C and then to about 1300 deg C to reduce molybdenum sulphide in the solid phase with tin in the liquid phase. J. S. Nachtman and H. G. Poole. No. 2,834,671.

Process for manufacturing anhydrous aluminum chloride from bauxite ore. Ore is heated in a rotary kiln and saturated at several points with molten aluminum chloride sludge. W. A. Pardee, assigned to Gulf Research & Development Co. No. 2,835,554.

Improved carbonyl process for rapid and efficient reduction of roasted nickel matte or other nickel oxide materials, such as ores containing nickel oxide, roasted sulphides, etc. DeW. H. West and A. B. Simpson, assigned to International Nickel Co., Inc. No. 2,835,557.

Improved leaching process for recovery of selenium from copper refinery anode slimes or other selenium-containing materials. L. E. Vaaler assigned to Diamond Alkali Co. No. 2,835,558.

Economical and simple method for recovering elemental sulphur from pyrites or other metal sulphide ores. C. C. Benz. No. 2,835,561.

Process for producing granular titanium from a titanium halide dissolved in a molten alkali or alkaline earth salt. O. B. Willcox, assigned to E. I. du Pont de Nemours & Co. No. 2,835,567.

These Patents—17 Years Old—Have Now Expired

Recovery of alumina from low-aluminum high-silica clays, slates and slags using lime roast to produce water soluble calcium aluminate. J. C. Séailles and W. R. G. Dyckerhoff. No. 2,248,826.

Leaching germanium with sulphuric acid and precipitating with tannic acid C. Zischkau (Asarco). No. 2,249,341.

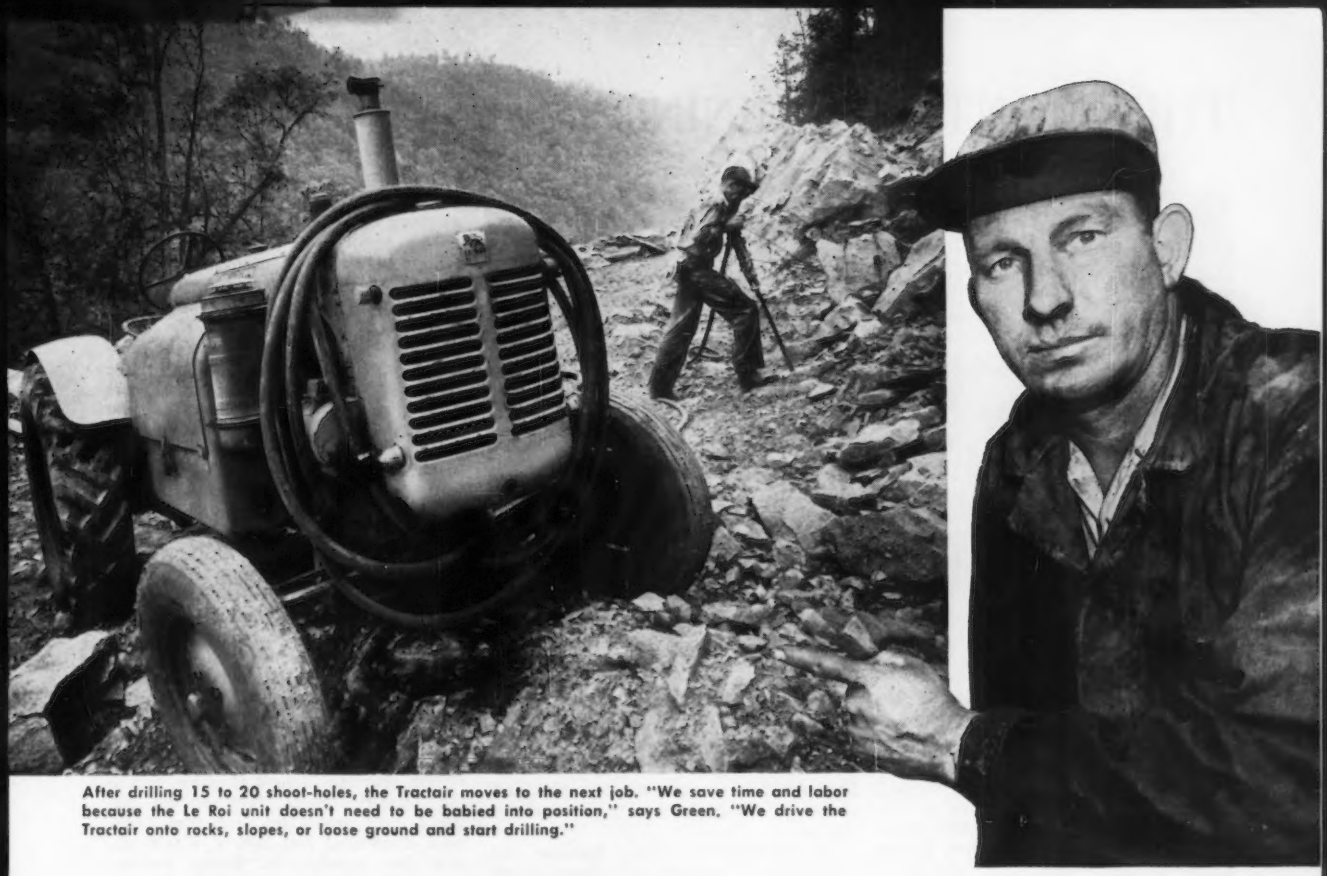
Sponge iron production. L. Wilson. No. 2,249,410.

Using HCl to extract alumina. A. W. Hixson and R. Miller. No. 2,249,761.

Solution processing for zirconium using strong acids and insoluble fluoride salts. C. Adamoli. No. 2,250,851.

Reducing phosphorus content of finely ground iron ore by smelting with manganese sulphate. Residue is reground and leached in acid to eliminate the phosphorus. T. W. Carney. No. 2,251,248.

Mr. North is patent consultant, Washington, D. C.



After drilling 15 to 20 shoot-holes, the Tractair moves to the next job. "We save time and labor because the Le Roi unit doesn't need to be babied into position," says Green. "We drive the Tractair onto rocks, slopes, or loose ground and start drilling."

Tractairs* Save $150 a Day at Blasting Site

Le Roi tractor-compressor used to drill shoot-holes for blasting overburden

Easier and safer to handle on rough terrain than dozer-drawn compressors, superintendent says

The V. N. Green Co., Brown's Branch, W. Va., saves $50 per day at each site by using Le Roi Tractairs to drill shoot-holes for blasting surface rock at their strip mining operations. When all three Tractairs are used, as is generally the case, daily savings total $150, reports John W. Green, job superintendent.

Previously-used wheel type compressors had to be moved around the site by a standby dozer. The 10 to 15 moves per day took two hours. The dozer lost the same amount of time, too, when its work was interrupted.

Mobility Minimizes Delays

Green points out that now "the Tractair is driven directly to the drilling area, the hose is attached, and drilling starts at once." In addition, Tractair's easy maneuverability over the extremely rough terrain cuts previous relocation time by more than half, and eliminates the need for the dozer as well as the operator.

Because it's self-propelled, the Le Roi tractor-compressor is ideal for this type of work. When a job is done, the Tractair provides fast transportation for the operator, drill, and compressor to the next site. There's no need to wait for other equipment to make the move.

What's more, close-to-the-job air power shortens hose lines, substantially reduces hose damage, and eliminates power loss. The shorter lines and Tractair's 125 cfm output permit the use of two drills, when necessary.

Performs Various Jobs

Bought originally for drilling shoot-holes, the Tractair can be used for other jobs, too. "We also use our Tractairs to break paving on road construction jobs where we do the resurfacing, to tamp backfill for drain pipes, and even to clean pavement by using a rotary brush attachment."

The self-propelled, multi-purpose Tractair can provide similar savings for you. And its ready adaptability to a wide range of attachments can help you reduce the cost of operations requiring costly, one-purpose equipment. Contact Le Roi today.

*"Tractair" is the registered trademark for Le Roi's combination tractor—air compressor.

WABCO

LE ROI Division of Westinghouse Air Brake Co., Milwaukee 1, Wisconsin, manufacturers of Newmatic air tools, Tractair,® portable and stationary air compressors, and heavy-duty industrial engines. Write us for information on any of these products.

T-77

NATIONAL ATTENTION was focussed on Wallace, Idaho in celebration of the "Silver Capital's" silver jubilee. Government and industry leaders spoke at ceremonies.

Wallace Celebrates a Silver Jubilee

WALLACE, IDAHO, hub of the famous Coeur d'Alene Mining District, aptly designated "Silver Capital of the World," observed the 75th anniversary of the area June 11-15 with a Silver Jubilee that was the biggest celebration in the history of the district.

More than 10,000 visitors from throughout the Northwest and more distant points swarmed into the picturesque little mountain community for the occasion.

Major events of the four-day celebration included a Silver Jubilee reception and banquet, a gigantic "Silver Cavalcade" parade, the crowning of a Jubilee queen, presentation to the city of a plaque honoring Col. W. R. Wallace, city founder and first mayor, the cutting of a mammoth birthday cake and various "give-aways" totaling more than $15,000 at Slippery Gulch, a carnival-type attraction designed to recapture the spirit and color of the early mining days in the west.

Augmenting the early-day theme was the attire of residents in costumes of the 1880's vintage. Men of the area grew beards for the occasion under penalty of fine or incarceration in a "bull-pen" in the center of the down-town area.

The celebration was spearheaded by Wallace Silversmiths Co. of Wallingford, Conn., which selected the northern Idaho city from among 44 others of the same name in this country for designation as "Silver Capital of the World" in conjunction with the observance of the company's 150th anniversary this year.

Several state Governors, Senators, and Congressmen from western mining states, as well as top Government officials in the mining field, participated in the festivities as guests of the city.

Principal speaker at the banquet was Sen. Wallace F. Bennett of Utah, co-chairman of the conference of western senators and a strong supporter of the mining industry in Congress. President John D. Bradley of the Bunker Hill Co. addressed a special Chamber of Commerce luncheon for the press.

Featured "give-away" of the celebration was a silver mine—the old Free Coinage claim in the Dobson Pass area north of Wallace. The patented claim, embracing about 16 acres of heavily-timbered land, is reported to have more than $100,000 worth of completed development work.

Other "give-aways" include a $1,000 building lot in Osburn and numerous merchandise items in the $300 to $500 category.

Jubilee Queen Cleo Bardelli and her two princesses, Barbara Britt and Camille Betts, were crowned at the opening ball and presided at festivities throughout the celebration. A special attraction at the opening of Slippery Gulch was the weighing of Queen Cleo in silver dollars.

The history of the Coeur d'Alene Mining District is customarily dated from 1883. It began with a gold rush which followed the discovery of placer gold by A. J. Prichard on the creek which now bears his name near the present town of Murray. Pritchard had made his discovery in 1881 and three years earlier, in 1878, had staked the first placer claim in the district on Prospect gulch which branches off the South Fork of the Coeur d'Alene river about midway between Wallace and Kellogg. The district had been opened to prospecting in 1863 when Captain John Mullan of the United States army and his crew completed a military road from Fort Benton in Montana territory to Fort Walla Walla in Washington territory.

The gold rush lasted only a few years, but meanwhile the first lead-silver lode was found, in 1884, on Canyon Creek in the South Fork drainage. The first two lead-silver claims, the Tiger and the Poorman, were staked on May 2 and 3, 1884, and they formed the basis of one of the district's earliest shipping mines, the Tiger-Poorman. Many of the district's most productive lead-silver lodes were discovered and located within the next few months—the Frisco, Ore-or-no-go, Morning, Evening, Gold Hunter, Polaris. Even the Yankee lode, which 40 years later was to provide the nucleus of the famed Sunshine silver mine, was located in the fall of 1884.

The biggest lead-silver lodes of them all—the Bunker Hill and the Sullivan—were found in 1885 and before that year was over initial shipments from them were made via lake steamer to railheads west of Lake Coeur d'Alene. The completion of rail lines into the district in the late 1880's and early 1890's brought the district into national prominence as a major source of lead and silver for the nation. With the discovery of the famous Hercules and Hecla mines around the turn of the century, lead production from the area jumped to more than 100,000 tons annually.

Gas Hills (*Continued*)

which have poundage contracts and which are suddenly finding themselves running higher-grade heads than assumed in the contracts. They are running out of contract faster than contemplated.

The Gas Hills negotiations provide an element of drama not found in the rest of the AEC's mill expansion plan.

Allan E. Jones, general manager, and his aide, Elton C. Youngberg, both of the Grand Junction office, spent a week recently in the district with John T. Sherman, assistant to the director in Washington of the AEC's raw materials division.

Their job was largely to answer questions, hear complaints and guide operators along the race path—where such guidance was requested.

As for other areas, negotiations continue as largely outlined when the Commission first detailed its findings some months ago as to ore reserves in the domestic arena, making its findings on what milling capacity needed to be added to existing facilities.

Supreme Court Finds Against Gold Miners

GOLD MINERS who sued the U. S. Government as an aftermath of the much-condemned L208 order of World War II, and who asked damages for the closure of their mines during the war, have lost their case for compensation before the Supreme Court.

L208, which suspended gold mine operation in the hope that unemployed miners would take jobs voluntarily in copper mining, according to the Government's case, was attacked by mining interests under the Fifth Amendment, which says private property may not be taken without just compensation. Six companies had earlier won arguments

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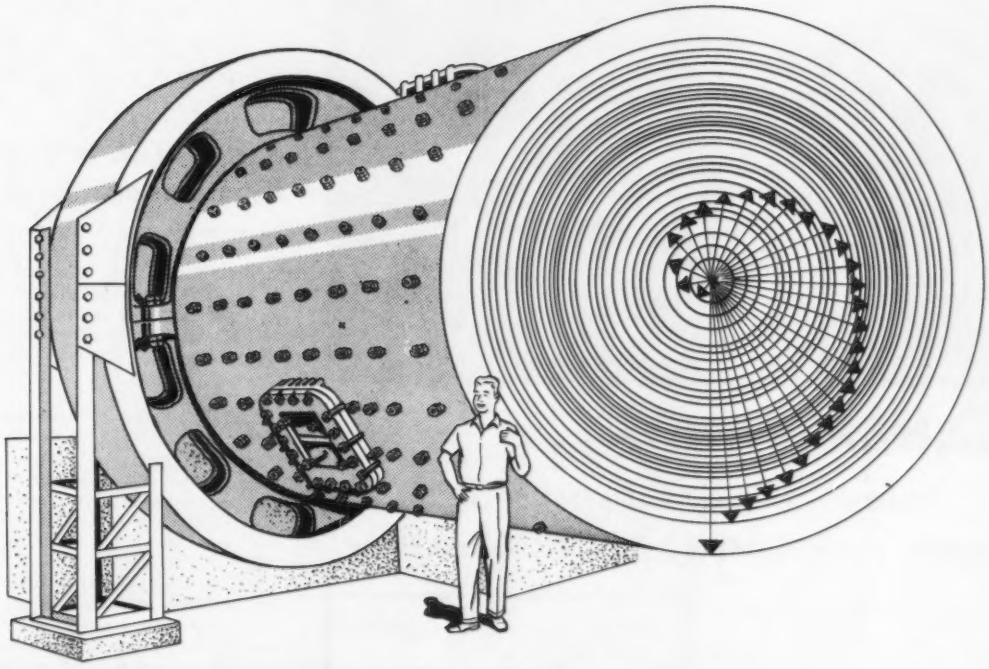

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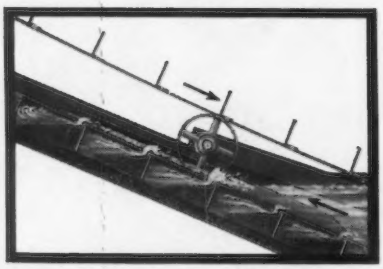

Section through "Overdrain" Classifier showing upward-moving, closed, washing compartments.

Unretouched photograph of "Overdrain" action above the belt—water and slimes discharging upwardly.

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Gold Miners *(Continued)*

before the Court of Claims that they were entitled to compensation. The Government, in opposing the Court of Claims decision, insisted that operation had only been suspended, and the mines not "taken." Justice Department said the ruling, if approved by the Supreme Court, could cost the U. S. more than $40-million. The vote was 7 to 2, with Justices Harlan and Frankfurter dissenting.

Future Markets Sought at Uranium Institute Meeting

MEMBERS OF THE URANIUM INSTITUTE of America met in annual convention at the Hilton Hotel, Albuquerque, May 25-28, 1958 for a program designed to seek out the future markets for peaceful use of uranium. Luncheons, dinners and symposiums were arranged to discuss all possible avenues.

Senator Clinton P. Anderson (Dem., N.M.) said that the AEC should continue in its good work, and should continue to re-evaluate and re-examine the situation and implement the present limited milling expansion (3,000 tons). He asked that they spell out and define "after 1962" and "mining property".

The Senator went on to mention several possible solutions to the present situation in the uranium industry, but said that in his opinion the best solution was not stockpiling but a long range program to develop peaceful uses of uranium—electric power, ship propulsion, process heat, the making of fresh water, and outer space propulsion.

He saw South America as the U.S.'s best customer for uranium and reactors. He added that Canadian producers pose a possible competitive threat to the domestic industry, but warned that (the Government) should continue to buy Canadian production. He thought that African contracts should be allowed to expire, and suggested the possibility of a plutonium stockpile in the U.S. In conclusion, the uranium industry's Washington champion said—don't ask for the impossible, but don't take less than you need; avoid the dole; keep digging the ore.

Speaking for the AEC, Allan E. Jones, manager, Grand Junction operations, discussed the southwest Texas area where negotiations are under way for a 600 tpd mill; North-South Dakotas where a 600 tpd lignite processing mill is being designed; and the re-evaluation of new milling capacity in Wyoming. He said that five mills have had their ore tonnage purchase contracts reduced, the others have not. Several contracts, in the Spokane, White Canyon and Moab areas, have been re-negotiated to give the independent miners a better break.

Discussing the cost of opening up a project, Mr. Jones quoted these figures—at 500 ft depth, 50,000 tons of 5 ft ore (0.25% U_3O_8) are needed to be economic. It costs between $25- and $40,000 to drill such a deposit, and about $200,000

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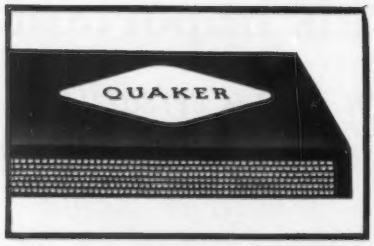

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UIA Meeting *(Continued)*

to develop it. At 1,000 ft depth, this orebody would be submarginal.

Turning to international aspects, Dr. Norman A. Spector, president, Vitro International, presented a penetrating analysis of the situation to date.

Some comments heard at the symposiums—"don't expect to sell new ore in an established milling area, go look someplace else—look at the market in your area before doing extensive exploration—mills may enter into foreign sales market with "P" license (mechanical concentrates and ore) or "R" license (processed concentrate)—good producers will have no trouble within the $8/lb price for concentrate after 1962."

Also heard—"After 1962, the miner will deal directly with the miller for his ore based on the $8 per lb concentrate price—on 0.25% ore it takes a 750 to 1,000 tpd mill to be economic at $8—miners with high-grade ore may get better than Circular 5 prices after 1962, but most miners will probably get less—Kermac's new 3,000 tpd mill will sell concentrate to the U.S. cheaper than any other mill in the U.S."

And these—"It costs $1 to 2 per lb to refine concentrate to metal, but the capital cost of a Hanover or Savannah River project add $18 or 19 a lb to the cost—it takes 400 tons of metal to inventory a 100 meg watt (heat) reactor and an additional 40 tons a year to refuel—the British are reported to be converting from natural to enriched uranium fuel."

Concerning Institute business, Gen. Patrick J. Hurley (president emeritus) declined to accept renomination for the office of Institute president. Administrative vice president Gordon A. Weller noted that—local problems are the problems of local state mining associations. The Institute must let the state associations take the lead in local affairs, with the Institute standing by to help wherever possible. He said "The Institute must represent the uranium industry as a whole, not any particular viewpoint or segment."

USBM Test "Freezes" A Hot Blast Furnace

WHAT HAPPENS inside a blast furnace may be more fully understood due to some work under way by the joint efforts of the U. S. Bureau of Mines, U. S. Steel Corp. and Linde Air Products Co. To chart the step-by-step reactions within the furnace burden, the team quenched a hot operating blast furnace with some 2-million cubic ft of nitrogen introduced over a period of two weeks. In addition, cooling water was run over the furnace shell.

Furnace was the experimental unit operated by the U. S. Bureau of Mines, which the Bureau wanted moved to Bruceton, Pa. Furnace was dismantled, and 3,000 six-inch cube samples of loose material were removed. Then the 5,200 lb solid mass of coke, metal and slag

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USBM Test *(Continued)*

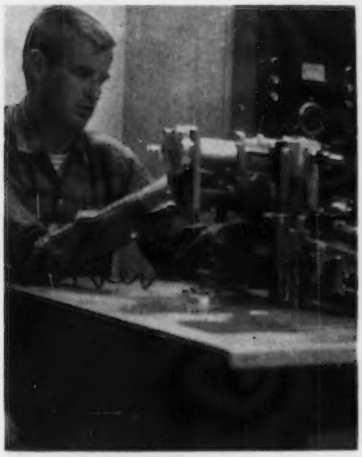
remaining in the furnace was diamond drilled for twenty 3-in. dia. samples.

Already a number of interesting things have been noted—coke was found throughout the slag and metal layers in the hearth; and raw materials charged into the furnace did not segregate to any extent during the descent into the plastic zone.

Idaho U. Studies Origin Of Latah County Clays

TWO UNIVERSITY OF IDAHO SCIENTISTS will conduct a special research study this summer on the origin of Idaho's clay minerals and clay deposits, according to Dean Earl F. Cook of the College of Mines.

The two are Dr. George A. Williams, associate professor of geology, and Dr. Donald F. Clifton, assistant professor of metallurgy. Dean Cook said the study was being made because of the growing economic importance of clay and clay minerals in the state of Idaho.



METALLURGY DEPARTMENT staff member Clark Adams operates X-ray diffraction camera which will aid in clay studies.

Cooperating with the College of Mines will be the Idaho Bureau of Mines and Geology and the department of physical sciences of the College of Letters and Science. Industry cooperators will include J. R. Simplot Co., Boise, and Anaconda Co., Butte, Mont. Both firms have shown an active interest in Latah County clays.

Last year, Anaconda used quantities of Latah County clays for experiments in a process the company reported it had developed for producing alumina from clays.

Soviets Announce Plans For Reactor Construction

THREE MAJOR and five smaller experimental atomic power installations will be built under the current Five-Year

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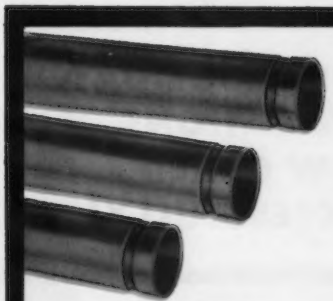

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This newly designed diamond coring equipment overcomes the problem of poor core recovery in soft, unconsolidated mineralized formations. By coring ahead of the circulating fluid, the pilot bit, in conjunction with the soft formation barrel, protects the core from moving fluid thereby preventing fluid erosion.

In a recent uranium operation at McKinley County, New Mexico, this equipment was used successfully in the Westwater formation, a soft, unconsolidated sandstone, where previously, high core recovery was very difficult, and many times impossible. The operator reports that this equipment recovered *over twice the core* (up to 98%) that had previously been recovered by conventional equipment. In addition to New Mexico, superior results have been obtained in soft iron ore formations in Southern Utah and Northern Minnesota with a slightly smaller barrel and bit. Excellent results have also been obtained in the Wind River formation of the Gas Hills area in Wyoming.

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Soviets (*Continued*)

Plan of the USSR, according to N. A. Nikolayev, of the Soviet atomic energy agency. The current Five-Year Plan, according to McGraw-Hill's London news bureau, began in 1955, but has been extended in some phases past 1960.

The three larger reactors will use either enriched uranium in two cases and natural uranium in the third. The five experimental stations will be used to study breeder reactions, use of uranium salts in heavy water as fuel, use of plutonium and U-239, and various agents for the heat transfer.

Oxidized Zinc Flotation Is Studied for Metaline

A PILOT PLANT to experiment with upgrading of oxidized zinc ores of northeastern Washington's Metaline district was expected to be completed in June at Washington State college. The plant will be operated this summer at the mining experiment station of the Washington State Institute of Technology at WSC.

ANDREW FERGUS, of the experiment station, checks flotation unit.

About a ton of the ore will be run through the pilot plant in an effort to develop a means of flotation of the oxidized zinc ores of the Metaline district.

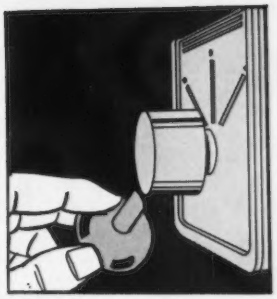
William C. Aitkenhead, director of the experiment station, said there are considerable reserves of this type of ore in the Metaline district.

Yuba Consolidated Buys Steel Fabricating Firm

IN A CONTINUING diversification program, Yuba Consolidated Industries has purchased the stock of Judson Pacific-Murphy Corp., a large steel fabricator of Emeryville, Calif., according to J. L. McGara, Yuba president.

Yuba's mining activity has been re-

Superior crusher with Hydroset mechanism



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If a *Superior* primary or secondary crusher stops under load, *Hydroset* mechanism lowers the mainshaft in seconds to help clear the chamber. Changing crusher settings is a flip of the switch operation, too. Only Allis-Chalmers crushers offer the speed and convenience of a hydraulically controlled mainshaft.

Bulletin 07B7870 will give you all the details. Ask your A-C representative for a copy, or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wisconsin.

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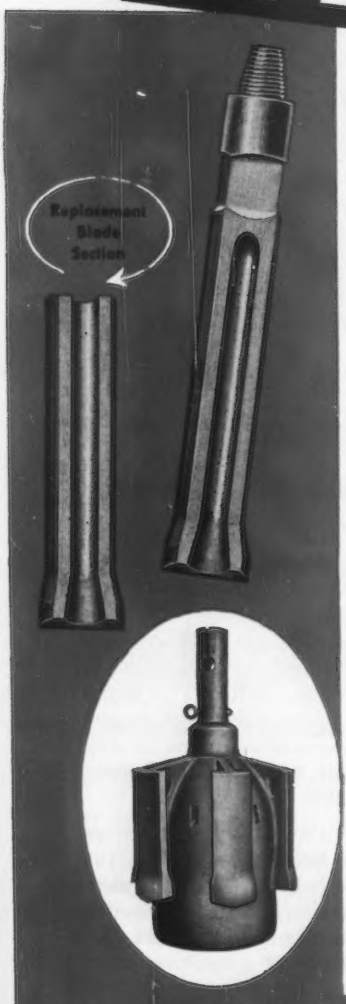

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Yuba *(Continued)*

duced in recent years as the firm diversified, but dredging is still under way at Hammonton, Calif. and Belmonte, Portugal. Yuba has also entered the missile program and anticipates "still further corporate expansion . . . when suitable opportunities can be found."

Consolidated Zinc Sees New Process Economy

USE OF the Imperial Smelting process for "blast furnace" production of zinc at Consolidated Zinc Corp. Ltd's Avonmouth plant will eventually increase over-all production by 8% and result in operating economies, according to the annual report.

Ore grades at Broken Hill have been raised and reserves increased. The company spent £331.515 in development of the bauxite deposit at Cape York in 1957.

Conversion to vertical furnace at Swansea Vale will provide double the Avonmouth capacity when it is completed in 1960, the report noted.

IM&CC Recovers Mica From a TVA-Made Lake

ON THE INSPIRATION of Charles E. Hunter, former TVA geologist, International Minerals Chemical Corp. has begun mining silt from behind Davy Crockett Dam in Tennessee, which has trapped silt from the North Carolina mountain streams containing green-flake mica.

About a half-million tons of commercial mica is estimated in the deposit, which IM&CC is dredging from the lake bottom, screening and removing by flotation.

IN THE U.S.

ALASKA

A new diamond drill program for the Admiralty Alaska Funter Bay nickel property is in the tentative planning stage. After a 1585-ft advance of the original 2565-ft adit at the 200-ft level, a diamond drill hole was driven 680 ft further from the face. This hole apparently did not reach the downward extension of the Mertie Lode. Several hundred feet back of the present face, a zone of copper-nickel mineralization was noted in the schist country rock, the first such occurrence noted at this horizon.

CALIFORNIA

Production of agricultural gypsum at the Lost Hills mines of H. M. Holloway, Inc., is being increased by 35% and company milling capacity is being

BECOLOY Makes the Difference On This Digging Dragline Bucket

Bucyrus-Erie BECOLOY buckets are built to outlast . . . designed to outstrip! BECOLOY, an exclusive alloy, makes the buckets tough . . . cuts weight while increasing strength. Performance-tested tooth and lip angle make them dig in fast, slice through smoothly for faster filling.

New-design Bucyrus-Erie BECOLOY buckets ride through the swing smoother because they're better balanced to cut bobbing and spillage. The dump is quick and complete, cutting seconds off every cycle.

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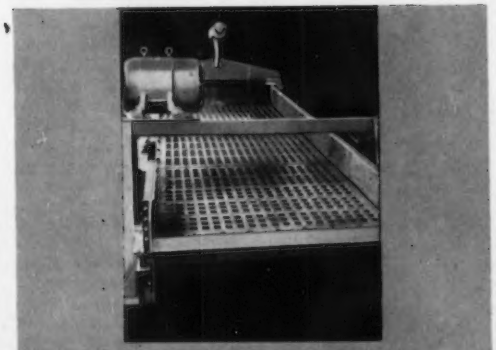
BECOLOY is used on arch, clevis plates, lip, and teeth. It has a tough, fibrous structure that imparts high strength.



HENDRICK H QUALITY PLATE LASTS ALMOST FOREVER

When economy in your processing operation means the difference between profit and loss—here are four good reasons for you to choose Hendrick H Quality Perforated Plate. This plate is tough and rugged. It's made from high carbon or stainless steels. High carbon can be heat-treated for longer life. Product uniformity is assured throughout the life of the screen. Hendrick H Quality Plate has full openings, to save you costs due to blinding. Deck charges are quick, for lowered labor costs.

Hendrick H Quality Perforated Plate is available either flat, corrugated, or stepped, in any desired shape, and with perforations of any size.

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Perforated Metal • Perforated Metal Screens • Wedge-Slot and Hendrick Wedge Wire Screens • Architectural Grilles • Mitco Open Steel Flooring • Shur-Site Treads • Armogrids • Hendrick Hydro-Dehazer • Distillation Column Internals

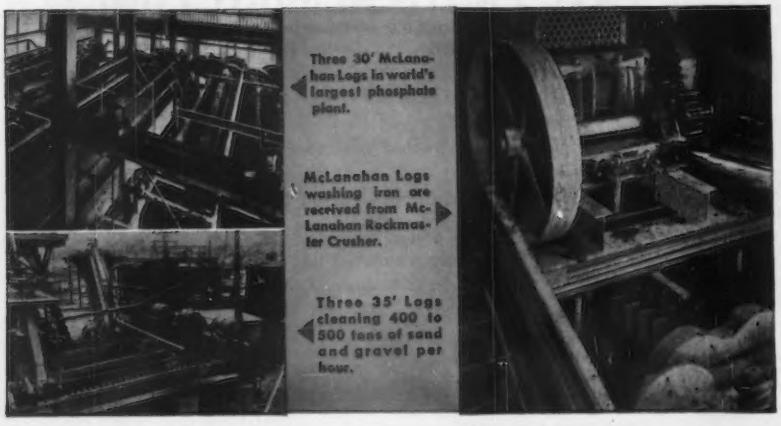
High Capacities of clean materials

Developed from the world's first all-steel log washers built by McLanahan & Stone in 1894, these machines produce high tonnages of exceptionally clean materials—removing tough clay, soft rock and refuse with unequalled speed and economy. Available in Heavy-Duty and Mudmaster styles. Write for Bulletins WLO-1155 and MM-755.

SINCE McLANAHAN 1835

LOG WASHERS

McLANAHAN & STONE CORPORATION
255 Wall Street, Hollidaysburg, Pennsylvania


Three 30' McLanahan Logs in world's largest phosphate plant.
McLanahan Logs washing iron ore received from McLanahan Rockmaster Crusher.
Three 35' Logs cleaning 400 to 500 tons of sand and gravel per hour.

California (*Continued*)

increased to 3500 tpd, company president Holloway reports.

National Tungsten Corp.'s plant has been taken off the market pending action of Congress on tungsten support measures, sources in Bakersfield report. The mill has been closed since the first of this year. Installed at a reported original cost of $225,000, the equipment includes a Kue-Ken primary crusher, a Kue-Ken gyratory crusher, primary and secondary ore bins, two Symons screens, one Simplicity vibrating screen, Denver jigs and a set of Allis-Chalmers rolls.

Plans for the reactivation of the historic Gwynne Mine in the Piute Mountains are being considered, Stewart Patterson, consultant, reports. Heirs to the property are expected to consider possibilities along with officials from the Bank of America estate administrator, and Alfred Siemon, lawyer for the administrator. Although old mine tunnels have crumbled, a new tunnel at a lower elevation seems quite a promising project, Patterson said. Famous for gold, the Gwynne also is reported to have rich tungsten deposits, and water is plentiful.

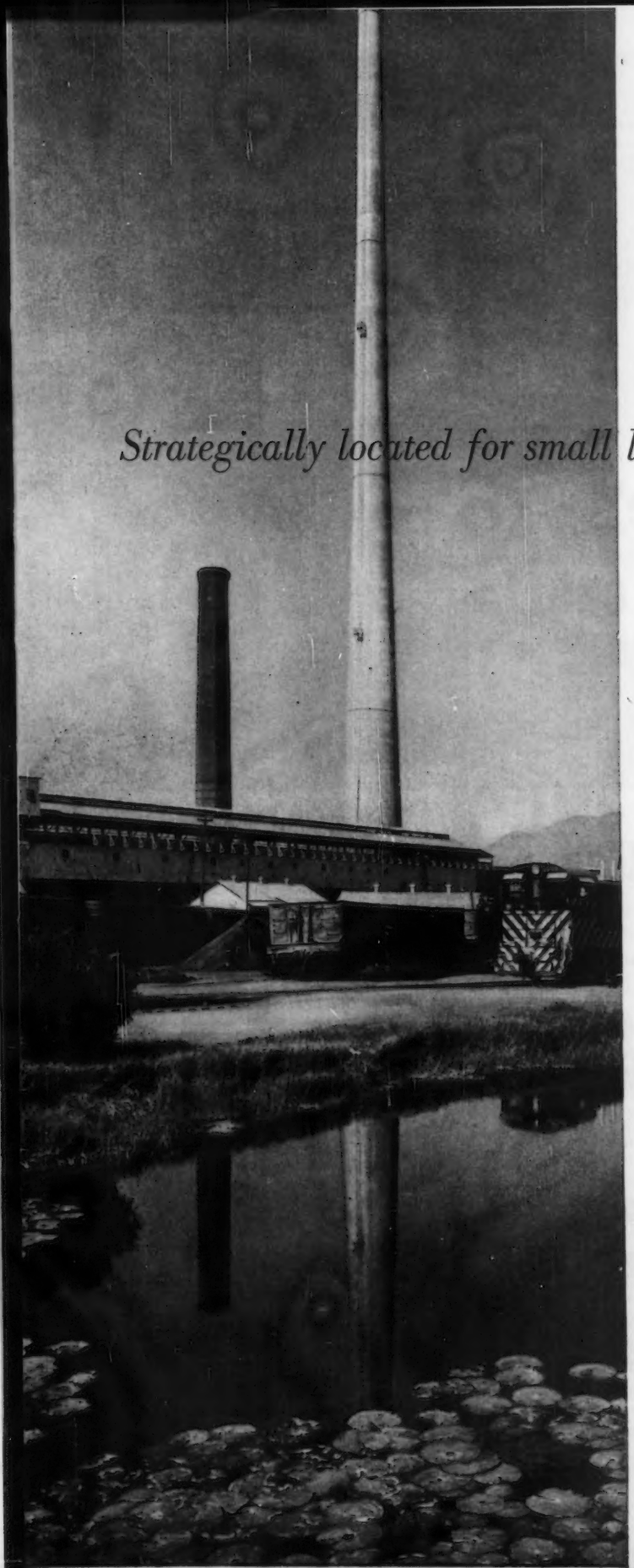
COLORADO

At Dove Creek in Dolores county Texas-Zinc Minerals Corp. reported that 750,000 yards of overburden have been removed from the Happy Jack mine properties in White Canyon, San Juan county, Utah. A. L. Hayes of Grand Junction, president of Texas Zinc said the property is now fully prepared for mining the uranium ore, which is being carried out. Texas-Zinc is a joint affiliate of the Texas Co. and New Jersey Zinc Co.

Securities and Exchange Commission has announced proposed changes regulations covering assessable stock. The proposed new Rule 136 would define the terms "offer, "offer to sell," "offer for sale", and "sale" to include specifically the levying of an assessment on assessable stock. Currently there is an exemptive regulation (Rule A-M) covering an original issue of assessable stocks of mining companies. Under the terms of this rule, in the levying of subsequent assessment, the company must supply the stockholder with certain specified information of a nature needed by the stockholder to determine whether to pay the assessment or allow his stock to be sold.

Rex Uranium Corp. of Farmington, N.M. received a Defense Minerals Exploration Administration loan for work on claims in Montrose county. Claims are in the general vicinity of mines which Rex has been operating for some years. Total contract value of the work is set at more than $30,000 with the Government contributing $22,740.

Cotter Corp. of Canon City announced



See ASARCO first
buying, smelting, and
refining all types of ores:
GOLD, SILVER, LEAD,
COPPER AND ZINC ores
and concentrates, blister
copper, mattes and residues
22 Smelters and Refineries

Strategically located for small lots or carload quantities...

LEAD SMELTERS
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Alton, Illinois
East Helena, Montana
El Paso, Texas
Chihuahua, Chih., Mexico
San Luis Potosi, S.L.P., Mexico

ZINC SMELTERS
Amarillo, Texas
Corpus Christi, Texas
Rosita, Coah., Mexico

COPPER SMELTERS
Hayden, Arizona
El Paso, Texas
Garfield, Utah
Tacoma, Washington
San Luis Potosi, S.L.P., Mexico

LEAD REFINERIES
Selby, California
Omaha, Nebraska
Perth Amboy, New Jersey
Monterey, N.L., Mexico

COPPER REFINERIES
Baltimore, Maryland
Perth Amboy, New Jersey
Tacoma, Washington

See management
at above locations
or write to main office.
American Smelting and
Refining Company,
Ore Purchasing Department,
120 Broadway,
New York 5, N. Y.

58-54

ASARCO

12" BLASTHOLES drilled CONTINUOUSLY in any rock . . . Here's the ONLY drill that can do it!

Joy 60-BH Drill in operation in a large Southwest copper mine.

the JOY 60-BH Super Heavyweight Champion

Here's the champion at drilling larger, lower-cost blastholes where the going is tough and high production is a *must.* The Joy 60-BH Super Heavyweight Champion has the power, the stamina . . . the sheer muscle . . . to bottom blastholes fast, shift after shift, month after month, in hard or soft formations. And it can drill out of the hole, too, when necessary. Here's why the performance of this big drill cannot be matched—it excels *in all three* of the features which determine bit penetration:

STRONGER ROTATION—Up to 14,850 ft. lbs. of torque can be applied *continuously* and safely. Accurate control of infinitely variable bit speeds and constant indication by gauge.

HIGHER BIT PRESSURE—Joy hydraulic-feed method of applying bit pressure—gripping the rod at the most logical place, near the collar of the hole—permits *continuous* pressures up to 75,000 lbs.; assures more accurate control than other methods.

MORE EFFICIENT CUTTINGS REMOVAL—Only Joy uses a heavy-duty, industrial-type, water-cooled air compressor to insure an optimum, continuous air supply.

Other features . . . rod handling device to reduce heavy rod handling and the longest derrick available to reduce or eliminate rod additions.

Only Joy has a complete line of rotary air-blast drills:

56-BH	6¼" maximum hole diameter
58-BH	7⅞" maximum hole diameter
59-BH	9" maximum hole diameter
60-BH	12" maximum hole diameter

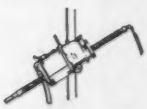
Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.
In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario*

Write for FREE Bulletin 251-4

Consult a Joy Engineer

WSW M7239-251

JOY . . . EQUIPMENT FOR MINING . . . FOR ALL INDUSTRY



Core Drills

Slushers

Rock Bits

Drillmobiles

Colorado *(Continued)*

that a contract has been signed for construction of a pilot plant uranium mill. Western-Knapp Engineering Co. of San Francisco was awarded the contract for building the mill which will process eastern slope uranium ore following the terms of a contract with the AEC. The mill is expected to begin operation prior to August 15, 1958.

New Jersey Zinc Company has announced the closing of its mine at Hanover, New Mexico and also discontinued roasting operations at its Canon City roasting plant. A company spokesman said that these new curtailments were made necessary by the continued flooding of domestic markets by foreign zinc.

Construction has started on a beryl ore processing plant near Loveland, Mineral Concentrates, Inc. announced. The plant, when completed, will represent an investment of approximately $250,000 and will be built west of Loveland on land furnished by the development fund of the Loveland Chamber of Commerce. Beryllium hydroxide from beryl mined in the Crystal mountain area will be produced at the plant.

Silver receipts at the Denver mint totaled 656,525 oz worth $594,113 in April compared with 15,230 oz valued at $13,803 in April 1957. A year ago the world price of silver was above the fixed U. S. Government price of 90½c an oz for newly-mined silver. Since then the world price has fallen below the Government price with the result that silver is again moving into Government hands.

Gold receipts at the mint last month declined to 52,955 oz worth $1,853,427 from 67,824 oz worth $2,353,849.

The Interior Department reported recently that it has awarded a $30,630 contract for exploration of strategic minerals in Saguache county. The Department's DMEA said the contract went to Gibralter Minerals Co. to hunt for uranium. The Government will stand for $22,972 of the contract amount.

Earl Knight of Breckenridge, president of the Knight Mining Corp., has announced that the firm has been granted $18,000 by the Defense Minerals Exploration Administration for exploratory work at the New York mine on Gibson Hill.

Milling of beryl ore in the Crystal mountains near Fort Collins, has been started by American Beryl Corp.

Orville Sandberg, firm's secretary-treasurer, said the mill at Masonville is "processing 100 tons of raw material daily".

IDAHO

Greater diversification of company operations in recent years is enabling Day Mines Inc. to maintain a satisfactory rate of earnings despite major curtailment at its lead-zinc mines in the

annual filter paper costs reduced 41%

at ANACONDA® with NETONE FILTER PAPER

- *Netone has service life of 12 cycles (old paper lasted one cycle)*
- *Easier to put on filter press, less installation damage*
- *Shows excellent resistance to solution shock*

At The Anaconda Company, Electrolytic Zinc Plant, located at Anaconda, Montana, Netone filter paper has been used exclusively on the Shriver filter presses since January 1, 1955. Netone is a heavy, neoprene filled paper possessing remarkable wet strength characteristics.

Prior to the use of the Netone paper on the Shriver presses, it was necessary to discard the kraft paper sheets then in use each time a press was cleaned. The life of the Netone paper in the same service is an average of 12 press cycles. Due to its greater wet strength, the Netone paper is less apt to be damaged during installation and has greater resistance to rupture from solution shock when the press is put in service.

Annual filter paper costs have been reduced 41%. The savings in labor and filter down time are also considerable.

Why not try NETONE Filter Paper on your filter? Test samples on request, no obligation, of course.

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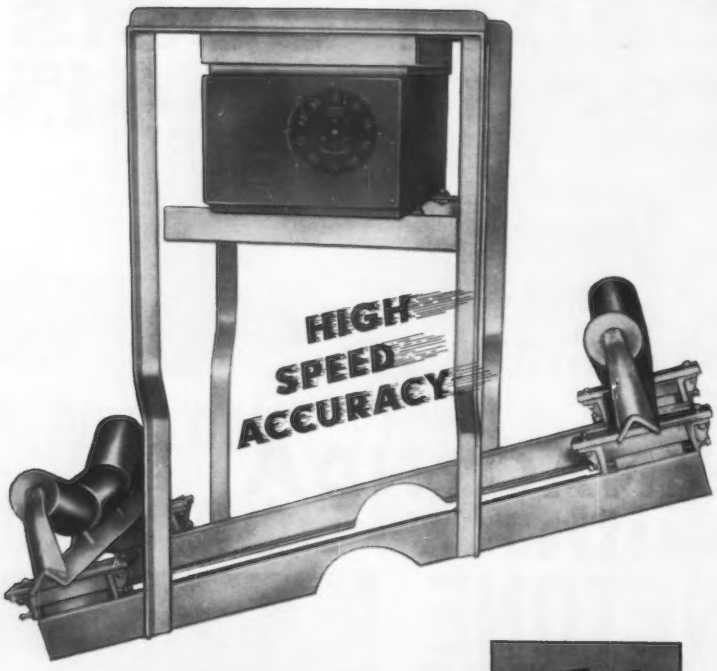
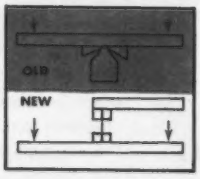
NEW Thayer Inventory Scale



Totalizes continuously and accurately any material being conveyed on an endless belt. Newly designed Thayer Scale fits over level or inclined systems at any location for direct or remote reading. Thayer Scales of 100 lbs. or 300 tons per hour capacity are available.

Recalibrates linearly with direct setting by just placing a known weight on the scale platform. The belt is not disturbed. No chains or involved calculations are necessary. Setting is positive, accurate, and long lasting.

Exclusive Thayer Plate Leverage System is guaranteed accurate for the life of the scale. There are no knife-edge pivots to wear down. Neither dust nor dirt nor vibration can affect its high accuracy. Thayer Scales are unsurpassed for simplicity and reliability under rugged conditions.



Write us about your bulk weighing problems for inventory or batching purposes.

THE Thayer SCALE

*THE THAYER SYSTEM OF PROCESS CONTROL BY WEIGHT

AUTOWEIGHTION

THAYER SCALE CORP., 14 Thayer Park, Pembroke, Mass.

Idaho (*Continued*)

Coeur d'Alene mining district, stockholders were told at their annual meeting in May. Major sources of current income are the Gold Dollar property in the Republic District of Stevens County, Wash., which is operated under lease by Knob Hill Mines Inc., and the company's 25% share in American Smelting and Refining Co.'s lease on the Galena silver-lead mine in the Coeur d'Alene District.

Ore reserves at the Gold Dollar have been tripled in both tonnage and grade in recent months through the development of two deeper levels. This improvement with depth has prompted Day Mines to retain the Salt Lake City geological consulting firm of Shenon and Full to make a thorough study of all company holdings (some 2500 acres) in the Republic area to determine if company operations are warranted.

Stockholders of Northwest Uranium Mines Inc., Wallace, have approved plans for liquidation of the company and sale of its assets to Silver Buckle Mining Co., owner of approximately 18% of outstanding Northwest stock. The deal had been recommended by directors as the "best procedure for protecting the stockholders' interest" in view of the AEC's ruling on new uranium milling commitments.

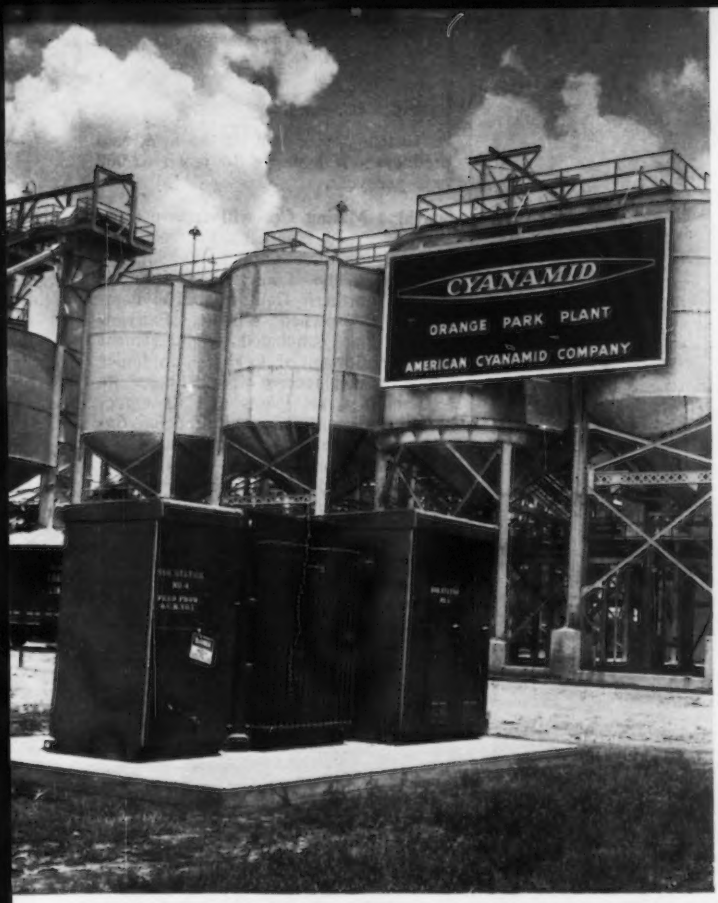
Road Built for 75-Tonners

MONSANTO CHEMICAL CO. will construct a private road between its elemental phosphorus plant at Soda Springs, Idaho and the phosphate mine, 11 miles away which will be designed to handle specially constructed 75 ton haulage units.

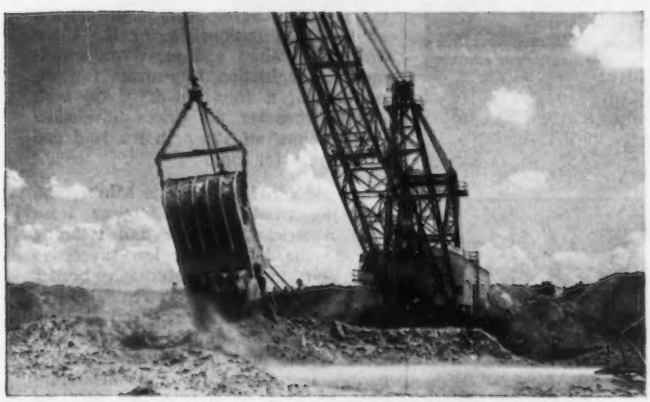
The road, to be constructed by Morrison-Knudson, will permit use of units by Mack Truck Co. which will triple the haul load possible under present conditions, a Monsanto official said. The new facilities are to be in operation during the summer of 1959.

American Smelting and Refining Co. cut back operations at its Page Mine west of Kellogg from a five to a four-day basis, effective May 18, in an effort to "spread the work" and at the same time reduce production and payroll costs. About 250 men are employed at the mine and mill. This cutback leaves only the Sunshine, Galena, Polaris and Lucky Friday among the major mines in the Coeur d'Alene district still on a five-day work week. The first three are predominantly silver properties and Lucky Friday also has a substantial silver content in its lead ore production.

Officials of Sunbeam White Sands, Inc., announced this week at Moscow that the firm plans to build a $300,000 plant at Lapwai, to produce filter sand. The project is to be constructed at the site of a sand pit where the firm has been testing filter sand for use at Hanford Works and for sand blasting work by the Bureau of Reclamation. Hugh



EFFICIENT, DEPENDABLE G-E 750-kva load-center unit substation provides recovery plant power for flotation and concentration equipment.



PRECISE CONTROL and dependable d-c power enable this Bucyrus-Erie dragline to handle 1100 yards of rock/hour. G-E equipment improves efficiency, cuts costs.

RUGGED G-E TRI/CLAD* 700-hp wound rotor motor drives this centrifugal pump to move slurry from mine to recovery plant. G-E Limitamp* control is shown at left.
* Registered Trade-mark of General Electric Co.

American Cyanamid specified General Electric to help . . .

PROTECT AGAINST DOWNTIME

Dependable electrical system aids continuous processing of phosphate rock

At American Cyanamid Company's new Orange Park washer and flotation plant near Lakeland, Florida, downtime in their continuous washing and recovery process for phosphate rock can cost hundreds of dollars per day. To keep downtime losses at a minimum, General Electric system-engineered electrical equipment is used.

G-E MOTORS, CONTROL and power distribution equipment help maintain a smooth flow of materials from mine through final recovery of phosphate. Installation of electrical apparatus on a system-engineered basis helped this plant get into operation faster and perform more efficiently.

WHEN EXPANDING OR MODERNIZING your operations which require above all, *dependability*, ask your nearest General Electric Apparatus Sales Office about G-E system-engineered electrical products. General Electric Company, Schenectady 5, New York. 660-39

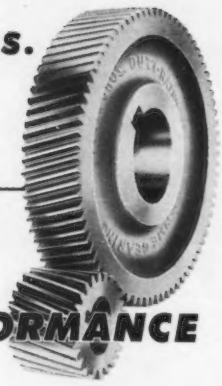
Engineered Electrical Systems for the Mining Industry

GENERAL ELECTRIC

ECONOMICAL General Electric motor control center undergoes inspection by American Cyanamid Supt. F. Boyd, (r), and G-E Sales Engineer G. W. Halstead.

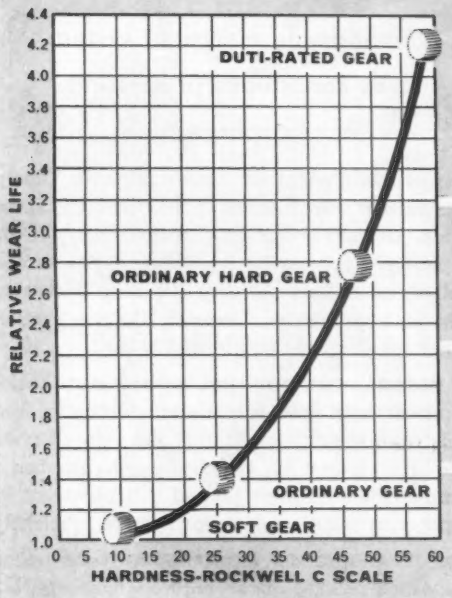
HERE'S WHY FOOTE BROS.

Duti-Rated LIFETIME GEARING



GIVES BETTER PERFORMANCE ...LONGER LIFE

GEAR PERFORMANCE COMPARISON CHART



DUTI-RATED GEAR— Hardened after cutting. Precision processing permits maximum hardness while holding accuracy within extremely close tolerances.

ORDINARY HARD GEAR— Hardened after hobbing and shaving; hardness limited to maintain reasonable accuracy.

ORDINARY GEAR— Hardened before cutting; hardening limited to maintain machinability.

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LINE-O-POWER Speed Reducer

AND YOU GET Duti-Rated Gearing in EVERY Line-O-Power Drive

LINE-O-POWER Right Angle Drive

Horizontal GEARMOTOR Speed Reducer

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Write for DUTI-RATED Gear and LINE-O-POWER Catalogs. See how you can get more for your drive dollar.

this trademark stands for the finest industrial gearing made

FOOTE BROS. Duti-Rated LIFETIME GEARING

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Better Power Transmission Through Better Gears

FOOTE BROS. GEAR AND MACHINE CORPORATION

4553 South Western Boulevard Chicago 9, Illinois

Idaho *(Continued)*

P. Terteling, president of the firm, said production is expected to reach 62,000 tons per year.

Sunshine Mining Co. will receive more than $500,000 from the Federal Government for discontinuing dredging operations in the Trinity dam reservoir area in northern California. The company's 95%-owned affiliate, Fairview Placers, has concluded an agreement with the Bureau of Reclamation under which it will receive $550,500 for its fee holdings, its leases and its agreement to discontinue gold dredging operations in the area. Dredge work was terminated April 1 after several years of operation during which more than 17-million cubic yd of gravel were washed.

Phillips Petroleum Co. is reported to be planning an extensive development program this year at the Little Bill uranium prospect in the Stanley area of Custer County. A contract for construction of a five-mile access road to the claims has already been let and work is under way. Initial development work a year ago yielded some commercial ore which was shipped last August. The property is owned by Bill Brooks, Juhl Kauffman and Melvin Peterson, all of Hailey.

Bunker Hill Co. showed a net loss of $341,644, or 22.6c a share for the first quarter of this year, as compared with a net profit of $567,863, or 34.9c a share for the corresponding quarter of 1957. President John D. Bradley said the steady increase in foreign imports of lead was responsible for the sharp drop in earnings and urged the enactment of legislation to provide for imposition of a four-cent tariff on both metals whenever the prices fell below "peril points" of 17c a lb for lead and 14½c a lb for zinc.

Stockholders of Jack Waite Mining Co. have approved a new 99-year lease with American Smelting and Refining Co. on the Jack Waite lead-silver-zinc mine on the Idaho-Montana border northeast of Wallace. The new agreement requires Asarco to spend at least $100,000 on exploration and development of the property over a 27-month period. It provides for a profit-sharing ratio of 55% to Asarco and 45% to Jack Waite after all exploration expenses and capital advances have been fully reimbursed. Asarco has been operating the property under a 40-year lease since 1934 and since its capital outlay was fully reimbursed (in 1949) has been receiving 35% of the profits.

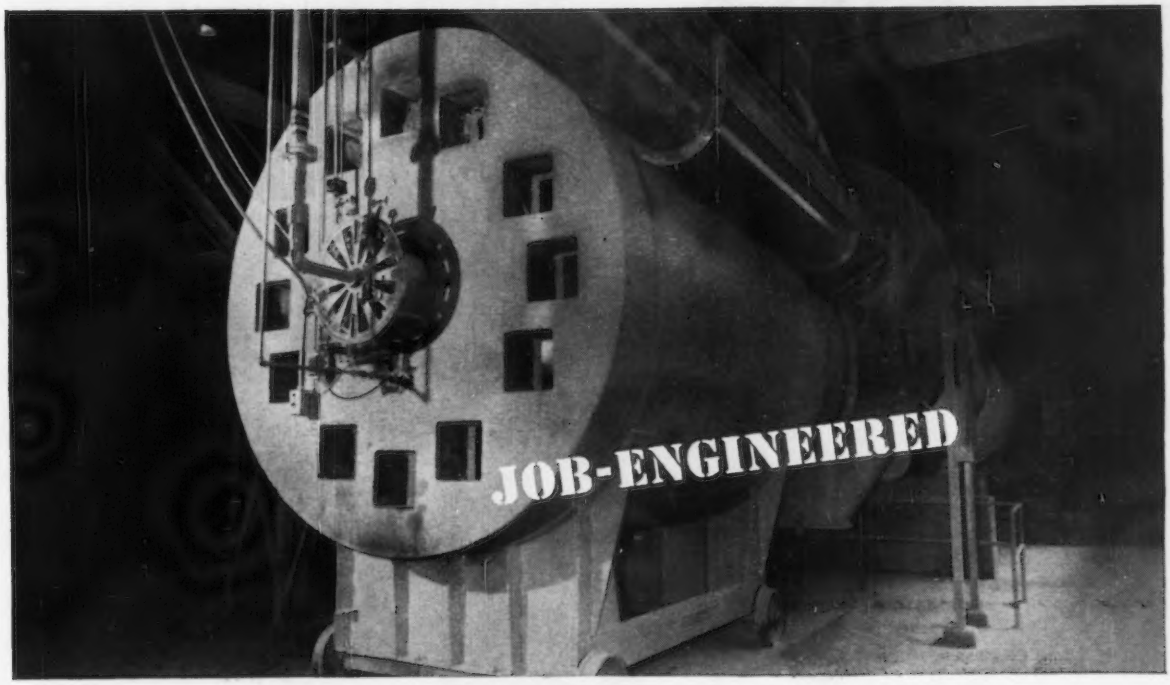
The last important lead-silver-zinc mine operation in southern Idaho has "called it a day."

Triumph Mining Co. officials announced sale of all equipment, including mine rail, hoist, concentrator, etc., to Machinery Center, Inc., Salt Lake City.

The firm, which has a record of mining dating back to nearly 80 years ago, is controlled by San Luis Mining

Helping others produce a better product...

STANDARD HERSEY DRYERS



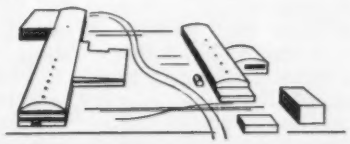
MINING FOR FOOD TO FEED THE EARTH— NEW CARLSBAD PLANT OF NATIONAL POTASH IS ON STREAM WITH STANDARD-HERSEY DRYERS!

Deep into the earth—1800 feet, deepest in the nation's potash industry—National Potash near Carlsbad, N. M., is mining for food to feed the earth, so that the earth will feed man better! Designed refinery capacity is 400,000 tons per year. And at the heart of this operation are 60-foot-long twin rotary dryers—*job engineered* Standard-Hersey dryers—designed and built by Standard Steel Corporation... a world leader in designing and manufacturing dryers, granulators, and coolers. Wide range and flexibility in Standard-Hersey dryers help you to produce almost any desired grade of fertilizer.

No matter how tough the problem, Standard Steel's *job engineering* solves it.

IF YOU HAVE A PROCESSING PROBLEM!

Standard Steel welcomes the opportunity to discuss with you any problems you may have in drying, cooling, or calcining. Our laboratory pilot testing equipment determines beforehand the best equipment for your problem.



STANDARD STEEL ACQUIRES LEADER IRON WORKS

SINCE Leader 1888

To meet the ever increasing needs of its world-wide customers, Standard Steel Corporation recently purchased the Leader Iron Works at Decatur, Illinois. Founded in 1888, Leader is well known for its work in the food, chemical and petroleum industries. In addition to its customary fabrication Leader will now manufacture Standard's line of heavy processing and road construction equipment.

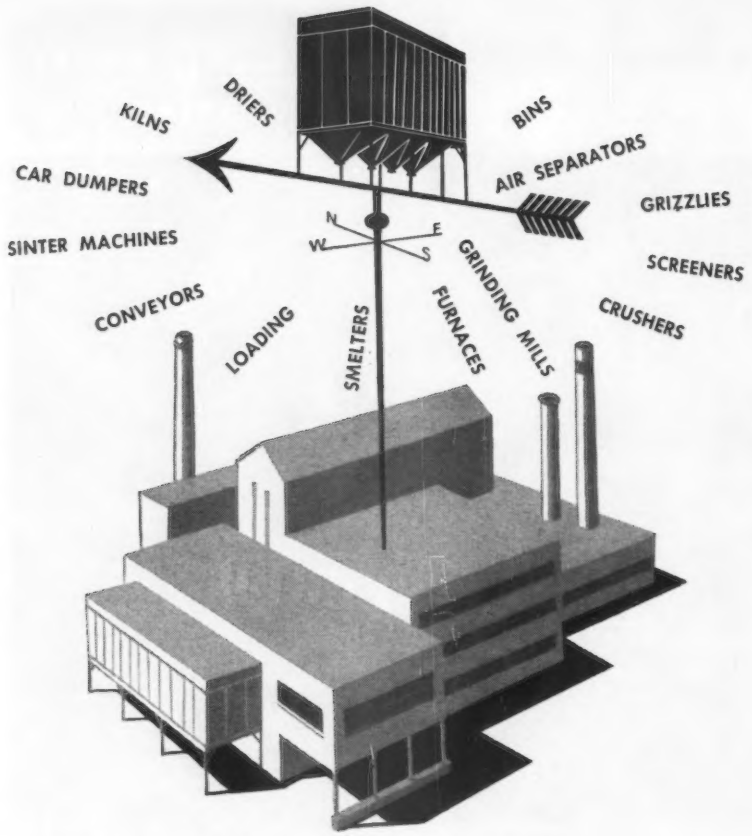
STANDARD STEEL CORPORATION

General Offices & Plant, 5060 Boyle Avenue, Los Angeles 58, California

Midwest Offices & Plant **LEADER IRON WORKS** *Decatur 60, Illinois*

(Division of Standard Steel Corporation)

ROTARY DRYERS • KILNS • COOLERS • ASPHALT PLANTS



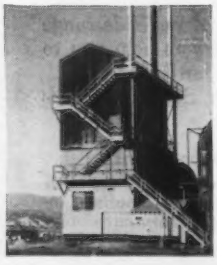
Everywhere you turn

in the mining and metallurgy industry

WHEELABRATOR® DUSTUBE® COLLECTORS

are turning problems into profits

Dust need no longer be a problem . . . but can be turned into profits throughout the Mining and Metallurgy Industry. Valuable by-products are salvaged from furnaces, sintering machines, driers, kilns and other equipment by the use of Wheelabrator Dustube Collectors. Highest efficiency plus lowest operating cost offers you recoverable dollars instead of recurring doubts. Dustube's simple cloth tube design provides the most dependable method of dust removal and recovery known. It has the inherent capacity for continuous, severe service, with a minimum of downtime.



Wheelabrator Collectors are particularly suited for the recovery of materials in hot gases. Through the use of synthetic filtration fabrics, including glass, orlon and dacron, they are readily applicable to severe heat applications. Dustube collectors are available as standard units or individually designed for your particular problem.

For information, Ask for Bulletin 372-D.

50 YEARS OF PROGRESS
WHERE PIONEERING LEADERSHIP INSURES PERFORMANCE

WHEELABRATOR
CORPORATION

438 South Byrkit Street **Mishawaka, Indiana**
Canadian Offices: Scarborough (Toronto) — Montreal

Idaho *(Continued)*

Co. and Homestake Mining Co. both of San Francisco and Snyder Bros., Salt Lake City.

Major cutbacks in operations were effected last summer. Further reductions were made in employment and work last fall. Only about 22 full time employes were employed at time of sale of equipment.

The company has been engaged in exploration for higher grade ores, without success. A major factor in close down was decision to conserve cash resources in this period of lowering nonferrous metals prices.

MINNESOTA

The 1958 iron ore shipping season was stepped up on May 16th when U. S. Steel Corp.'s Pittsburgh Steamship Div. went into service. On that date four of its ore boats were loaded at Two Harbors while a fifth, the Cason J. Callaway, was delayed because of propeller trouble. The Two Harbors season opened on May 14th when the Clifford F. Hood was loaded.

R. F. Elstad, president of Oliver Iron Mining Div. announced that the reduced demand for steel would result in a reduction in iron ore production. He said that the need for continuing Oliver's extensive ore beneficiation operations is greater than ever because Minnesota ores must compete in the market on the basis of quality, not quantity. New heavy media sections now under construction at Hibbing and Coleraine will be in full operation this year, as will new sizing units at Virginia and Chisholm. Oliver will operate the Sherman group and the Monroe at Chisholm and the Hull-Rust at Hibbing. In the Canisteo district, the King, Plummer and Arcturus are operating and in the Virginia-Eveleth district the Stephens, near Aurora, the Rouchleau group at Virginia and the Pilotac taconite plant at Mountain Iron will produce. The Pioneer and Soudan underground mines on the Vermilion range will continue to work. The Oliver will operate its four concentrating plants: Trout Lake and Plummer at Coleraine, the Arcturus at Marble and the Hull-Rust at Hibbing.

The M. A. Hanna Co. recalled some 275 men when ore shipping began at its South Agnew, Morton, Hunner, Weggum, Mississippi group and the Harrison group at Cooley, and stripping at the Pierce mine in Hibbing where the big dragline and three-mile long conveyor belt are again in operation.

Zenith mine at Ely on the Vermilion range has been closed by Pickands, Mather & Co. The mine was opened in 1892 by the Zenith Mining Co. and has been operated quite steadily since then by Franklin Rockefeller, Oliver Iron Mining Co., Zenith Iron Mining Co. and PM & Co. with total shipments of over 20-million tons and about 1-million tons remaining. A few mainte-

TRACDRIL

has 3 speed-up features

This new G-800 self-propelled Tracdril provides a completely mobile drill mounting . . . can be "spotted" into position with ease! It takes uneven ground in stride . . . tows its own compressor up steep grades. With feed motor moved to rear of drill carriage, toe-holes are started only 9″ from bottom. On top-holes, drill controls stay in easy reach.

Two heavy-duty deep-hole drills now available with standard-neutral-reverse rotation for use with coupled steel: CP-400DR, 4″ cylinder bore, 2½″ holes to 50 feet; and CP-450DR, 4½″ cylinder bore, 3″ holes to 75 feet. *Chicago Pneumatic Tool Co., 8 East 44th St., N. Y. 17, N. Y.*

1. Hydraulic sliding cone gives carriage additional lift for tramming over uneven terrain . . . firmly sets drill carriage stabilizing foot pad on ground.
2. Hydraulic positioner provides proper setting of the drill carriage angle — for left, right, forward and back positions.
3. Hydraulic controls elevate the U-arm with a finger touch . . . insure quicker drill carriage positioning.

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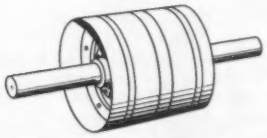
INDOX V...

and STEARNS knows how to use it!

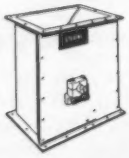
Amazing new ceramic permanent magnet material inspires revolutionary developments in tramp-iron protection.

First to take advantage of the remarkable magnetic properties of Indox V is Stearns — the leader in design and development of magnetic equipment for more than 40 years. *Only Stearns uses Indox V* in magnetic tramp-iron separation equipment. Here are four brand-new Stearns separators that are introducing a new era of tramp-iron protection for all industry.



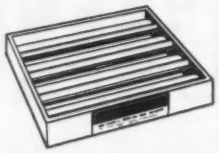
NEW INDOX V MAGNETIC PULLEY

Installed at head of belt conveyor system, outperforms conventional permanent magnet pulleys, equals deep-field power of electromagnetic types. Radial design boosts holding efficiency for maximum separation. Standard widths and diameters to match your present system. Ask for Bulletin No. 1021-D.



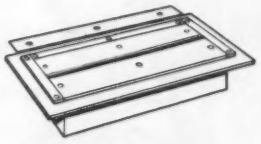
NEW INDOX V MAGNETIC DRUM

An ideal unit for process industries where granular materials are conveyed in enclosed chutes or spouts. Revolving stainless steel cylinder inside a welded steel housing carries material over stationary magnet assembly, which holds iron particles beyond discharge of non-magnetic product. Indox V produces exceptionally uniform field *30 to 40 percent stronger* than old-style permanent magnet drums. Complete range of types and sizes for any installation. Write for Bulletin No. 1051-D.



NEW INDOX GRATE MAGNET

Easily installed in any hopper or floor opening, chute or duct, guards your product and plant against dangerous tramp iron. Collecting tubes, with continuous magnetic poles along their entire length, leave no "dead" spots. Effective area is actually 400 percent greater than in ordinary grate magnets! Complete range of types and sizes for any installation. Bulletin No. 1072-D.



NEW INDOX V PLATE MAGNET

Provides separating efficiency far superior to ordinary plate magnets. Powerful, uniform magnetic field traps iron particles in flowing material in chutes, ducts, spouts or on conveyors. Excellent tramp-iron protection at low cost. Write for Bulletin No. 1073-D.

WHAT IS INDOX V?

Indox V is a highly oriented barium ferrite *ceramic* material. Its energy is comparable, on an equivalent weight basis, to that of Alnico V — the most powerful permanent magnet material available. Indox V magnets possess unique advantages — light weight, high electrical resistivity, great resistance to demagnetization, inexpensive, non-critical raw materials—plus an energy product over three times that of non-oriented ceramic magnets. Indox V is used in separators manufactured by Stearns exclusively.

STEARNS MAGNETIC PRODUCTS

A DIVISION OF THE INDIANA STEEL PRODUCTS COMPANY

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Minnesota (*Continued*)

nance men will be retained. The company has also closed the Albany underground mine at Hibbing, opened in 1903. Since that year it has shipped over 15-million tons with more than 2½-million tons remaining in the property.

Snyder Mining Co. has exercised its option on ore lands in northern Wisconsin, about three miles northwest of Butterworth in Ashland County. The new lease is near another block of land leased earlier.

The Susquehanna mine of Republic Steel Corp. at Hibbing has been closed. The mine was opened in 1906 by the Buffalo & Susquehanna Iron Co. Its operation was taken over by Republic in 1933. It is the deepest pit on the Mesabi range. After shipping a total of about 30-million tons, it has nearly 3-million tons in place.

MICHIGAN

North Range Mining Co. closed its Warner mine near Amasa during the first week of May, laying off about 100 men "until there is an upturn in demand for iron ore." A maintenance crew of eight men is retained. The mine had been working four days a week. North Range has resumed washing at its Book mine which was closed during the winter. The plant operates on two shifts and employs 24 men. It is the only ore treatment plant on the Menominee range. The company is operating the Champion mine on the Marquette range and the Leonidas at Eveleth, Minn. on the Mesabi range on a four-day week schedule. The Penokee mine at Ironwood on the Gogebic range is idle.

The Peterson mine of Pickands, Mather & Co. at Bessemer, Gogebic range, has a unique stockpiling system which combines safety and low operating cost. It consists of two reversible tramways with two 10-ton cars which can travel 1500 fpm. The cars are each suspended from two cable spans extending 1500 ft from a loading terminal tower to two 172 ft tail towers. The stockpile can be 70 ft high and average about 307 ft wide. The loading terminal is 125 ft high. It supports the track cables terminal rails, hopper bins, loading chutes and conveyor equipment. One operator controls the entire stockpiling operation, and he can see the tramway cars at all times as they go back and forth.

NEVADA

A contract has been signed by Denver's Thunderbird Development, Inc., calling for the sale and processing of two million tons of gold and silver tailings at Millers, 15 miles north of Tonopah in Esmeralda county. The announcement was made by Russell W. Bartels, secretary of Thunderbird Development Inc., who said the purchase will be made from

CF&I Expansion Type Rock Bolt—with Pattin Type D-1 expansion shell . . . for 1⅜" holes . . . with right or left hand threads (to allow tightening by left-hand rotation of drilling machines). Also available, the Pattin D-5 shell for use with ¾" and ⅞" bolts in holes of 1⅝" diameter . . . and CF&I Slot-And-Wedge Type Rock Bolts.

stronger, safer, space-saving support... AT LESS COST

strength—when anchored in mine roofs or walls, CF&I Rock Bolts provide maximum resistance to load with a minimum of displacement. Pattin expansion shells double the usual shell expansion, grip twice as hard.

safety—high strength steel, (to American Mining Congress specifications), provides ample factor of safety . . . fully safety-tested . . . proven in use throughout widespread applications . . . CF&I Rock Bolts eliminate the danger of timbers bending or buckling under load.

space-saving—cumbersome, space-consuming timbering methods may be unnecessary. CF&I Rock Bolts permit maximum utilization of available work space and ventilation facilities.

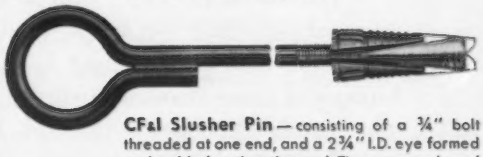
cost-saving—less bulky, easier to haul and install than heavy timbers. When used with Realock Metallic Fabric for lagging, CF&I Rock Bolts offer proved initial-cost savings up to 35% over timber sets.

OTHER CF&I PRODUCTS FOR THE MINING INDUSTRY

CF&I Grinding Balls • CF&I Grinding Rods • Wickwire Rope • Mine Rail and Accessories • CF&I Industrial Screens • Realock Metallic Fabric

***ALSO,* for your convenience,**
CF&I SLUSHER PINS

When you make your own slusher pins, the cost may be high and you may not get the best possible results. As a customer service, CF&I makes available Slusher Pins made to the same high standards of quality, performance and minimum cost as our Expansion Type Rock Bolts. Modified CF&I Rock Bolts also make excellent hangers for such equipment as air and water pipe, electrical cable, vent tubes and ventilating fans.



CF&I Slusher Pin—consisting of a ¾" bolt threaded at one end, and a 2¾" I.D. eye formed and welded on the other end. These are anchored in 1⅜" diameter holes by means of Pattin Type D-1 expansion shells, and successfully withstand the pull from slusher drums.

A 20-min. Rock Bolting color movie "Make Mine Safety" is available for showing, through the offices listed below.

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HOME OFFICE AND PLANT

MURRAY HILL NEW JERSEY

TORONTO, ONTARIO, CANADA

Nevada *(Continued)*

Desert Mines Inc., headed by Ira Jacobson, of Tonopah. The Colorado firm will install a portable mill at the site, and will employ four or five men per shift when operations start.

Metals Exploration Corp. is processing 20 tpd at its mercury mine 20 miles southeast of Lovelock in Pershing County. Six pounds of mercury per ton are being extracted and operations are going on six days per week. Ore is crushed and passed through a 22-ft rotary furnace heated with diesel fuel. An H-retort distills mercury from soot that collects, using propane gas for the process. The company also has a four-tube battery of retorts working. Mining is being done on three levels at 5500, 5521 and 5550 ft elevations, and the ore is reached through a 400-ft adit.

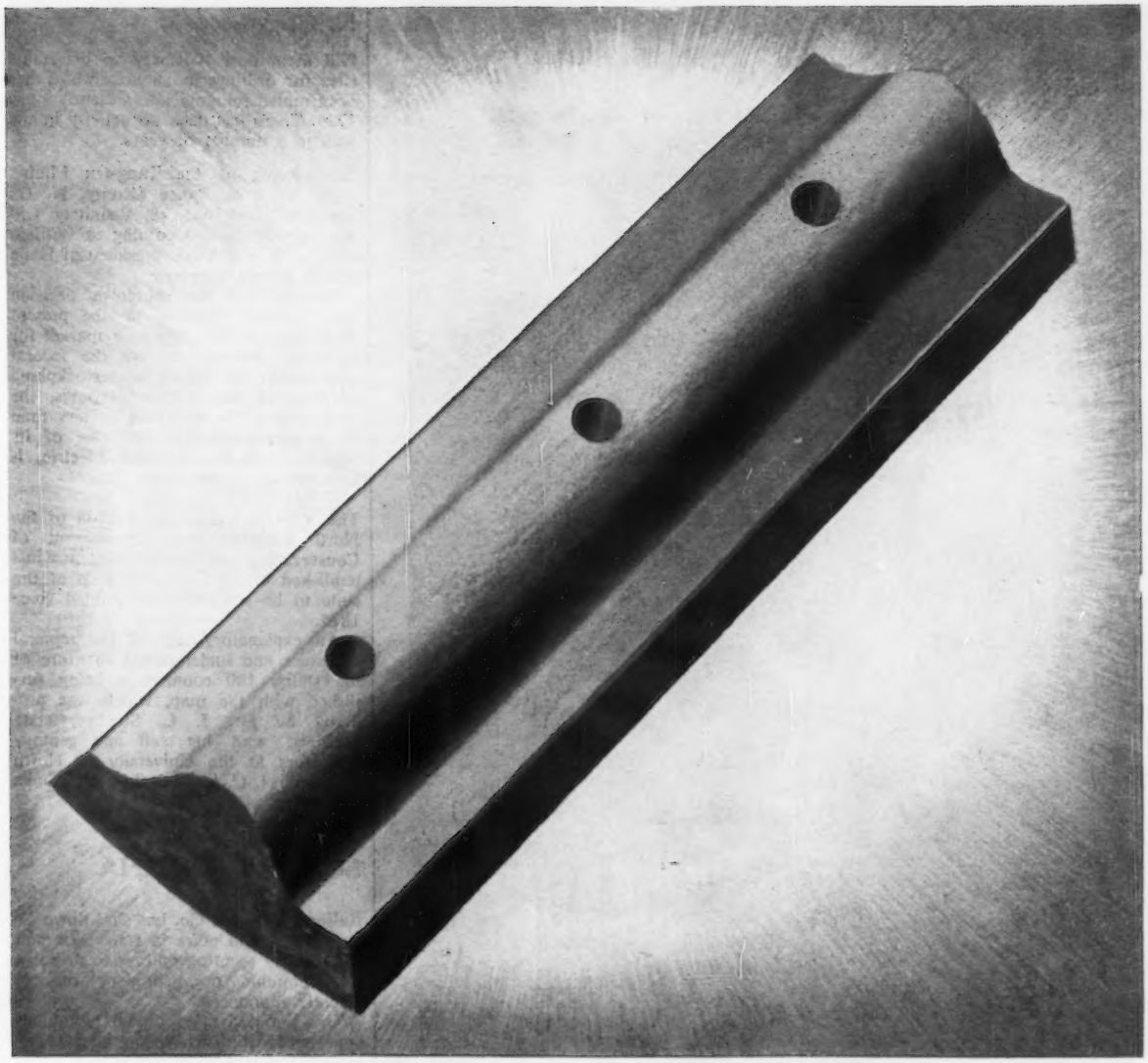
Dodge Construction Co. closed down its iron ore mining and shipping operations during May. For the last few years the firm had been producing large quantities of ore from its properties in Coal Canyon, northeast of Lovelock. Ore was hauled to Colado where it was loaded on Southern Pacific cars for shipment to Stockton, Calif., and put on ships for transportation to markets in Japan. Recent Japanese agreements with India have shut off the demand for American ore, and resulted in the shutdown by Dodge. Forty men who were employed in the operation were left without work by the order.

Round Mountain Gold Dredging Corp. during May increased its milling operations from 7,500 to 10,000 yd of gravel daily at its property in Smoky Valley, which is under lease from Nevada Porphyry Gold Mines under a 15-year agreement. Increased operations began after the jigs had been properly bedded and other sections of the reconstructed plant had been broken in. More than 2-million yd of overburden have been removed at the site, and stripping operations are continuing.

A new order issued on May 18 by the Department of Interior in Washington excuses owners of mining claims on federal land in certain areas of Washoe, Pershing and Humboldt counties from doing assessment work for the fiscal year ending June 30, 1958. The order affects the area that will be released from the Navy's aerial gunnery range as a result of a cutback in original demands for territory. It was believed that the Navy might release the area just before the assessment work deadline, making it impossible for claim owners to get their work done in the interval. The order was issued at the request of Nevada Congressman Walter Baring to prevent any unfairness resulting from such a situation.

NORTH CAROLINA

A field crew from the Tennessee Copper Co. recently began studies in the Gold



LINER DIMENSIONS: WIDTH 18-3/4", LENGTH 36", BASE THICKNESS 3", WAVE 3-1/2"

NI-HARD DOUBLES MILL LINER LIFE

OVER 2,200,000 TONS OF TACONITE GROUND WITH RUGGED, ABRASION RESISTING NI-HARD (ABK METAL) LINERS PRODUCED BY THE AMERICAN BRAKE SHOE COMPANY

Even hard taconite is no problem with Ni-Hard* nickel-chromium cast iron! That's why one plant – using chilled Ni-Hard (ABK Metal**) liners – was able to achieve double the life of any other liner material or design. The Ni-Hard liners ground over 2,200,000 tons of taconite ore in 10½'x16' rod mills with 85 tons of 4" rods rotating at 14.7 rpm.

Ni-Hard can mean important savings for you, too. Authorized producers throughout the country are ready to supply liner segments for your mills. Write Inco for the name and address of the one nearest you.

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Good equipment properly arranged produces a better cake. This processing mill, built by Stearns-Roger, is an efficient work shop for uranium processing.

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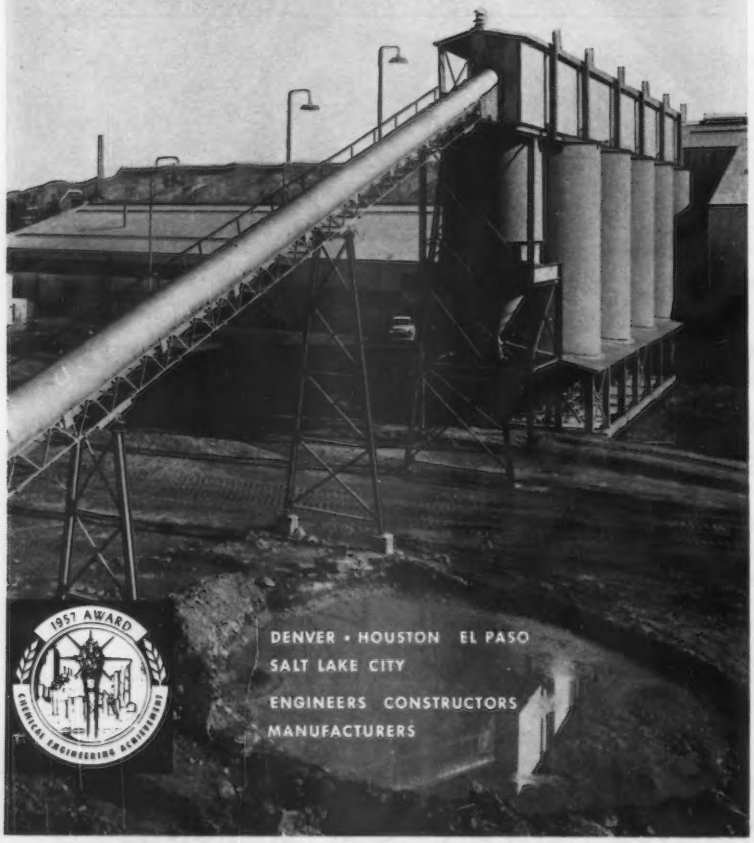


1957 AWARD
CHEMICAL ENGINEERING ACHIEVEMENT

DENVER • HOUSTON EL PASO
SALT LAKE CITY
ENGINEERS CONSTRUCTORS
MANUFACTURERS

N. C. *(Continued)*

Hill area, near Salisbury to determine sites for drillings in an area which has been mined for gold intermittently since 1799. There has been no activity in the area in a number of years.

The closing of the Tungsten Mining Corp. plant in Vance County, N. C., scheduled for June 28, definitely will not be permanent according to William Weaver of New York, president of Haile Mines, parent company.

Weaver said the shutdown decision was reached because, at the present time, there is "absolutely no market for tungsten" due to the fact the federal government has discontinued stockpiling of tungsten for defense purposes, the steel industry is operating at less than 50 per cent capacity and one of its biggest customers, General Electric, is oversupplied at this time.

The Mineral Resources Division of the North Carolina State Department of Conservation and Development has just published the first geologic map of the state to be compiled and printed since 1875.

An explanatory text of the mineral resources and underground structure of the state's 100 counties is being furnished with the map, which was prepared by Dr. J. L. Stuckey, state geologist, and his staff and geology professors at the University of North Carolina, N. C. State College and Duke University.

SOUTH CAROLINA

Kaiser Aluminum Co. has shut down its land acquisition office in Greenville and has stopped securing options to prospect for aluminum ore, company officials recently announced.

This put a damper on an aluminum boom speculation which had been growing for the past two years.

UTAH

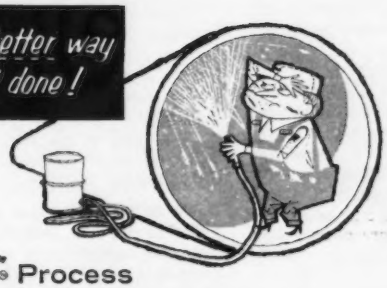
Uranium property in the Lisbon Valley region has been leased by the Shattuck Denn Mining Corp., according to its president, Thomas Bardon. The long-term lease was negotiated with Kerr-McGee Oil Industry Inc. and Anderson Development Co.

Shattuck Denn will sink a shaft approximately 800 ft to gain access to an orebody outlined by drilling done during the past year. The ore produced will be shipped for processing to the Kerr-McGee uranium mill at Ship Rock, N. M.

VIRGINIA

The New Jersey Zinc Co. announced that effective July 1 its zinc mine at Ivanhoe will be shut down, and production at its nearby Austinville Mine will be substantially reduced.

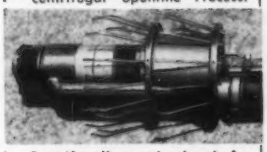
there's a better way to get it done!



by

"Spunline" Process

Cement mortar lining is applied uniformly by centrifugal "Spunline" Process.



Centrifugally rotating head of Spunline applicator provides uninterrupted continuity.

Newly developed Spunline Process... a combination of the world famous Tate and centrifugal processes... is now available for cement mortar lining of 6" to 16" diameter pipes "in place." Permits application of thinner lining with closer tolerance... permits lining past smaller openings and corporation stops... through many bends and certain fittings. Particularly advantageous with cast iron pipe... restores flow coefficients, protects against corrosion, contamination. *Write today for full information.*

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PNEUMATIC GROUTER and "PEA SHOOTER"

GROUTERS — Readily converts to "Pea Shooters". In stock for immediate shipment.

The Mayo Pneumatic Grouter has performed capably on jobs ranging from tunnels, mines, and shafts to foundations and railroad subgrades. Simple and efficient in operation, it may also be used for injecting chemical soil stabilizers into caving or running ground.

For grouting back of lagging in rock tunnels or back of liner plates in soft ground, the Mayo Grouter is readily converted to a "Pea Shooter" for shooting Pea or "Bird's Eye" gravel.

The Mayo Pneumatic Grouter has no moving parts within the Grout . . . gives years of trouble-free service. Shop tested to twice working pressure. Capacity: 3½ cu. ft., charging height: 3 ft.

For complete details and specifications, write for Free Bulletin 13

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Look how these drillers are cutting footage costs with HOFFMAN ORIENTED DIAMOND DRILL BITS

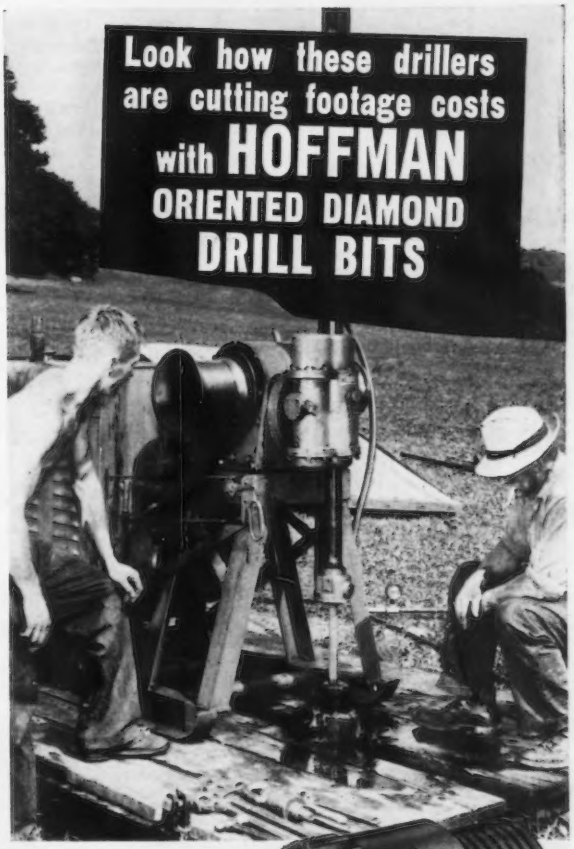

Photo courtesy Acker Drill Co.
Proving out deep coal veins.

other drillers are cutting costs too . . . with Hoffman Bits

Hoffman Bits are engineered to insure the greatest speed and efficiency for the specific formation being drilled. They not only cut faster with low power consumption . . . they permit more accurate job estimates from smooth, easy-to-recover cores.

There's a specially made Hoffman Bit for practically any drilling job . . . prospecting, testing, air and mud coring, reaming, etc. Ask Hoffman about the right bit for your job . . . at no obligation.

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Diamond Drilling Experts Since 1902

Virginia (*Continued*)

Also, it was announced that work on the development of the new Flat Gap Mine, Treadway, Tenn., has been suspended.

WASHINGTON

The mining experiment station at the Washington State Institute of Technology at Washington State College is continuing its experiments on upgrading of Mount Spokane area uranium ores.

William C. Aitkenhead, director of the experiment station, said research at WSC has shown that the Mount Spokane ore, chiefly autunite, can be successfully upgraded by froth flotation.

He reported high grade concentrates and excellent recoveries from some of the ores. In one case the work produced a concentrate containing 11.2% uranium oxide from ore containing 1.27% uranium oxide. The recovery was 97.8%. In another case, a concentrate of 5% uranium oxide was produced from ore containing 0.13% uranium oxide. The recovery was 85%.

In the work at WSC, Aitkenhead is using a 600 gram laboratory flotation cell to work with the Mount Spokane ore.

Research also has been conducted on Spokane Indian reservation ores, but officials said the work has been more successful with the Mount Spokane ore. Large tonnages of low grade uranium ores have been indicated in both areas and the goal of the WSC research work is to find an economical method of preconcentrating the ores.

Dawn Mining Co. had a net profit of $788,765 for the first seven months of full scale operations at its Ford uranium processing plant and the Midnite mine on the Spokane Indian reservation.

This was reported in June at a stockholders meeting of Midnite Mines, Inc., Wellpinit. Midnite owns 49% of Dawn and Newmont Mining Corp. owns 51%.

The 400 tpd mill went into operation last September.

Silver Buckle Mining Co. has started open pit development of some 600,000 tons of 0.13 U_3O_8 uranium ore on the Peters Lease in the Spokane Indian Reservation, 50 miles northwest of Spokane.

Clark L. Wilson, general manager, said the action follows ratification of a deal between Northwest Uranium Corp. and Silver Buckle, both controlled by New Park Mining Co., Salt Lake City.

Only some 200,000 tons of 0.20 U_3O_8 ore will be mined by Conex Corp., Portland, Ore., firm under contract for selective pit development.

Mr. Wilson said that arrangements were underway for sale of 25,000 tons annually of 0.20 U_3O_8 grade ore to the Dawn Mining Co. mill 20 miles distant.

WYOMING

Nichols and Thompson Core Drilling Co., Boise, Idaho, has resumed core drilling on taconite deposits of Columbia-Geneva division of U. S. Steel Corp. near South Pass City.

Columbia-Geneva is conducting extensive tests to determine the feasibility of a multi-million dollar ore processing mill in the area.

Split Rock Mining and Exploration Co. has leased 29 uranium claims in the Crooks Gap area to K. C. Heald of Fort Worth Tex., and the Crooks Gap Mining Co.

Claims involved are the Sundog claims 1-24 and Sun claims 1-5. The transaction involved payment of $7,500 on execution of the lease, $10,000 if renewed next year, $15,000 for 1960 and $10,000 for each year thereafter.

Split Rock also kept a 15 per cent royalty on open pit or strip mining operations and a 10 per cent royalty on underground production.

F & M Ready Mix Co., Casper, has announced plans to launch a $250,000 dredging operation for sand, gravel and gold.

A dredge capable of handling 2,000 yards of gravel and sand per day is being installed on a 10-acre lake just off the North Platte river near Casper. The lake will be dredged to a depth of

METAL ION RECOVERY PROBLEM SOLVED–

PROVED IN COLORADO URANIUM MILL

This revolutionary installation uses CST (Trade-mark) exchangers by INFILCO, which–

CONTACT–Provide excellent mixing and intimate contact of liquid and resin for rapid ion exchange;
SEPARATE–Continuously separate the slurry and resin by directed flow and dynamic separation;
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Evidencing INFILCO eminence in engineering, this is the first installation for truly continuous commercial-scale, counter-current ion exchange of uranium. Applicable also to recovery of other metal ions from slurries, turbid liquids or clear liquids, it offers you substantial savings in capital investment and operating and maintenance costs. It is discussed in literature. Write today for Bulletin No. 1930.

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30 to 45 ft in hopes of recovering gold by flotation.

Allen McKenzie, Firm's co-owner, said mining engineers believe there may be gold in the North Platte river which can be recovered along with normal sand and gravel recovery operations.

F&M plans to work a year at the present site on the lake, then move to Paradise Valley where they have enough sand and gravel deposits for three years operation.

A bill to double the acreage of public coal lands which could be leased by a single firm, approved by the House Interior mines and mining subcommittee in Washington, would pave the way for the greatest industrial development in Wyoming history, according to Gov. Milward L. Simpson. He said it would open the door for a $50 to $150-million synthetic fuels industry and development of iron ore deposits in southeastern Wyoming.

IN CANADA

ONTARIO

Deep developments at Cochenour Willans gold producing property in the Red Lake area are continuing to provide excellent results. The 9th level, now fully

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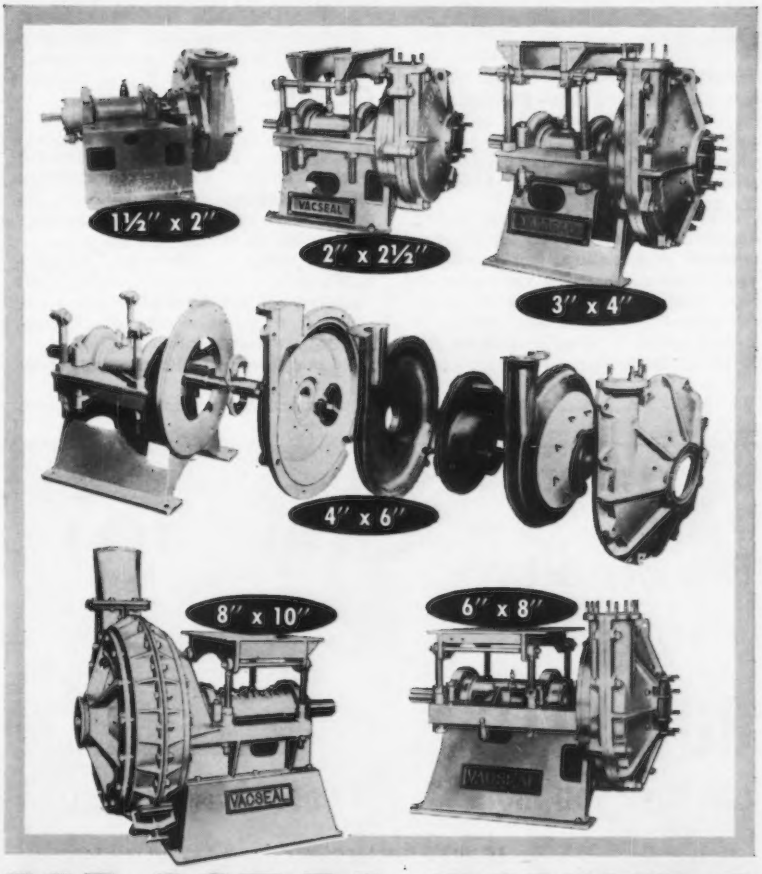

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Ontario (*Continued*)

opened, has proved to be the best to date in both grade and tonnage, while the 10th level "promises to be just as good." The shaft deepening program, which will provide eight new levels below the present bottom or 11th level, has been completed.

Agnico Mines, the former Cobalt Consolidated Mining Corp., has extended its silver mining operations by buying the Nipissing-O'Brien Mines, a veteran silver producer in the Cobalt area.

Mine output is being stepped up from 80 to 120 tpd with ore being trucked to the new 450-ton Agnico Mines mill.

QUEBEC

The Quebec Government has granted Quebec Lithium Corp. Ltd. exclusive use of a refining process developed by the research department of Quebec's Department of Mines.

The company, Premier Maurice Duplessis said, will build a refining plant near East Sullivan Mines, between Amos and Val d'Or, at a cost of "several hundred thousand dollars."

He said that Pierre Beauchemin, president of Quebec Lithium, had been largely instrumental in finding the new mineral in Quebec and declared the government felt it would be "fair to allow him the exclusive use of the process for a seven-year period."

Duplessis said the research department, under Dr. Maurice Archambault, had succeeded in finding a process which would permit refining the mineral at a cost much less than the existing formula.

An agressive Canadian mining trio—Norwanda Mines, McIntyre Porcupine, and Canadian Exploration Ltd.—has entered into an agreement to finance development and production, if warranted, of the big zinc-copper-silver deposit of Mattagami Syndicate in the Mattagami Lake area. The 30-claim group is located in Galinee Twp., about 90 miles north of Senneterre. Initally the three principals will put up $400,000 for the operation. Diamond drilling by the syndicate was estimated to have indicated over 14-million tons averaging 13.5% zinc, 0.65% copper, 1.11 oz silver, and 0.016 oz gold per ton.

BRITISH COLUMBIA

The black sands of Graham Island are too low in iron ore content to make production of steel worthwhile, B. C. Mines Minister Kenneth Kiernan has announced, popping a bubble of hope for a steel industry based on the tar sands of the Queen Charlotte Islands.

In January last year, when he lifted exploration and development bans on the Island's iron ore deposits, Kiernan said the "potentially huge deposits could form the basis of a B. C. steel industry."

Now, exploration reports from three companies have shattered the dream. The firms are Mogul Mines Ltd., Utah Co. of the Americas, and a B. C. subsidiary of Westport Chemicals of Seattle.

Bethlehem Copper Corp. Ltd., announced in mid-May it is making a start on underground work at its Highland Valley property. The announcement was in line with statements by nearly all the major companies that they are either starting, or thinking about starting, substantial exploration programs in B. C. again, from the Nicola Valley in the south to the Yukon border.

About 12,000 claims are expected to be stacked in B. C. this year, compared with a normal yearly 6,000 and about 26,000 in 1956.

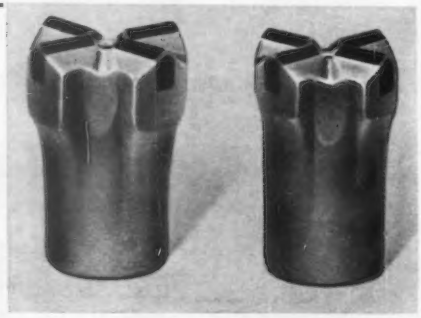
Torwest Resources Ltd. has signed an agreement with Noranda Exploration Co. Ltd., for development of Torwest's 54-claim prospect in the Highland Valley.

The claims, the Star and Bob groups, adjoin holdings of Trojan Consolidated Mines Ltd., and those of Northlodge Copper Mines Ltd. Under the agreement a new company will be formed and Norwanda will take shares at $1 each to provide working capital.

Giant Mascot Mines, Ltd., which shut down last July due to dwindling ore, recently reopened to produce barite.

The company has a firm contract for

Brunner & Lay "400" carbide Rok-Bits gauge sizes: 1⅛"; 2"; 2⅛"; 2¼"; 2⅜" and 2½"—"X" design body.



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Brunner & Lay taper-socket Rok-Bits—gauge sizes: ("A"—#7 and #12° taper) 1¼"; 1⅜"; 1½"; 1⅝"; 1¾". ("A", "B" and #12° taper) 1½"; 1⅝" and 1¾".

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a year to deliver 1,500 tons of barite a month to McPhail Engineering of Tacoma, but hopes to double its production within six months. After two years, the two companies may go into a joint venture.

Cariboo Gold Quartz Mining Co., Ltd. reports an over-all improvement in its ore picture. It had been anticipated that pay ore available in the old mine would have been exhausted by May 1, but two orebodies widened out and are "presently yielding substantial quantity of above-average grade." Thus it will be several months before the No. 1 shaft will be closed.

Recent development work has opened up a "very substantial replacement orebody" which should provide abundant sweetener for some time to come, say company spokesmen.

Empire Development Co., Ltd., which shut down its Quatsino iron ore operation on Vancouver Island last January has again hit full-scale production.

Empire reports additional funds have been made available including an extra loan of $200,000 from the Industrial Development Bank and advances from Mannix Ltd.

MANITOBA

A contract for the construction of a new branch line between Optic and Chisel Lakes in Northern Manitoba has been awarded to Mannix Co. Limited, of Calgary, Canadian National Railways has announced.

SASKATCHEWAN

Additional underground development and greater proven and probable ore reserves at the Eldorado uranium mine in the Beaverlodge area are reported by Eldorado Mining and Refining Ltd.

The company states that Beaverlodge mine's reserves at the beginning of this year are 23% higher than in early 1957—3,484,000 tons averaging 0.21 per cent uranium oxide content.

IN LATIN AMERICA

ARGENTINA

An agreement has been reached by the Argentine Federal Government, the Province of Catamarca, and the Tucuman University for the nationalization of Catamarca's Agua de Dionisio (Farallon Negro) gold, iron and manganese mine, according to Dr. Alberto V. Tedin, Secretary of Industry.

A five-man board will manage an 82,420 acre area, ceded by the national authorities. But mine's total ore bearing area will be 8,320 acres, estimated to contain minerals worth up to $250-million.

VENEZUELA

The Venezuelan Development Corp. is studying plans for a $30-million aluminum plant with an initial annual capacity of 25,000 tons, according to Lt. Col. Rafael Alfonzo Ravard, president of the government-financed development agency.

The plant, to be built near San Felix on the Orinoco river, may start production within three years and may have an eventual capacity of 50,000 tpy. Venezuela's present aluminum consumption is approximately 16,000 tpy.

PHILIPPINES

Efforts are being made to change the laws controlling the government-owned nickel deposits in Surigao to encourage entry of private capital. The government's participation in net profit is to be reduced from 50 to 35%. The operator will have five years in which to bring the property to production, with the

Packer-Ette at United Electric Coal Company's Fidelity Mine packing Bemis-made waterproof (laminated) bags. Packer-Ette is equally efficient in packing polyethylene bags or tin cans.

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Philippines (*Continued*)

option to continue operations under the contract beyond the 50 years permitted.

Atlas Consolidated Mining & Development Corp. milled only 19 days in April because of continuing water shortage. Production came from 190,231 tons milled, averaging 0.71% copper, estimated to contain 2,408,000 lb copper. Shipments of iron ore from Mati totalled 8,800 tons valued at $80,000.

Philex Mining Co. will put its new Santo Tomas mill into operation in June, with capacity of 1500-2000 tpd of copper-gold ore. Concentrates will be sent under contract to Nippon Mining Co. of Tokyo.

IN AFRICA

Although there was a general decline in the production of major minerals in Northern Rhodesia at the beginning of the year, copper showed a distinct improvement. This proves that agreed cutbacks by some producers and the temporary closure of one or two mines have been more than outweighed by output from new mines and increased production from others.

Tanganyika has stepped up its mineral exports in the first two months of this

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Africa *(Continued)*

year by about 25% as compared with the same period in 1957. Silver is an example of the general upward trend. Production of the refined metal increased from 2,525 oz last year to 3,297 oz this year.

Diamond drilling at Sanyati, in Southern Rhodesia shows ore reserves estimated at over 15-million tons, containing 1.4% copper, 1.35% lead and 2.85% zinc. Sanyati Mines (Pvt.) Ltd. is a subsidiary company of Messina (Transvaal) Development Co. Ltd.

Plans are being considered for the development of the Zandpan mining area, adjoining the Hartbeestfortein mine on the west and Vaal Reefs on the north. These properties are in the Klerksdorp district, west of Johannesburg. There is a strong possibility that a new mine will be established in the area.

A comparison of May returns with those of the comparable period of 1957 shows that gold-mining in the Union of South Africa is growing more and more expensive. Of the 50 mines taken for comparative purposes, only 16 showed lower working costs per ounce.

A new $4,200,000 diamond treatment and recovery plant was opened by H. F. Oppenheimer, chairman of De Beers, at Kimberly on June 10.

The giant plant is capable of handling 20,000 tpd. The plant will serve Du Toitspan, Bultfontein and Wesselton mines as well as De Beers Mine, should it come back into production.

IN AUSTRALIA

In June, and many months ahead of schedule, the first batch of uranium ore was fed into Rio Tinto Mining Co.'s Mary Kathleen mill.

Rio Tinto owns more than half of Mary Kathleen while the United Kingdom Atomic Energy Authority financed two-thirds of the $28-million project.

Though it will eventually handle 1,000 tpd, it will be some time before the plant comes into full-scale operation and uranium oxide is produced for the UKAEA, according to Blake Pelly, Australian Rio Tinto's chairman.

The Australian Government has no plans to assist other branches of mining in the same way as it will aid the copper industry. Government experts believe that prices for major metals will definitely go up though they do not expect a return to the previously inflated level.

United Uranium N. L. expects to begin uranium oxide production by the end of 1958. The company has begun converting the Northern Hercules gold plant to uranium milling and is erecting an additional plant where the leach-solvent extraction process will be used.

Wellington Alluvials Ltd., gold dredging company sponsored by Broken Hill Pty. Ltd., is about to close down. A series of

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Australia (*Continued*)

bores completed ahead of the dredge showed disappointing results and recent dredging results were not up to expectations. During its lifetime, the company produced 202,200 oz of gold and paid $500,000 in dividends.

IN ASIA

Malayan production of tin concentrates in April amounted to 3,658 tons of metal, based on an assumed assay of 75.2%.

At the end of the month, there were 63 dredges, 430 gravel-pump mines and 64 other tin mines in operation, making a total of 557 active mines. During the month, 10 dredges closed down and 4 resumed operations.

A 2½-year, $2-million aerial survey of Pakistan's natural resources has revealed that there is about 5,000 square miles of territory which may contain future oilfields and mineral deposits.

The survey was done by the Photographic Survey Corp. Ltd. of Toronto. "Most of this territory" said supervising geologist A. G. Jones, "is about 5,000 ft above sea level and looks very much like the Colorado plateau. It shows outlines of belts of chrome-bearing rocks and certainly contains manganese."

IN THE FAR EAST

Russia, according to a recent notice in Soviet News, is building its northernmost hydro-electric station in the permafrost zone of Siberia to supply power to the Mamakan-Chu district and the Bodaibo gold district. Rated at 60,000 kilowatts, the station will start generating in 1960. The construction site is more than 600 miles from the nearest railway line—on the Mamakan river near the 58th parallel.

Soviet News also reports that the USSR hopes to build 70 hydro-electric power stations on the Amur river and its tributaries, an area rich in iron ore and coal deposits.

The stations will have a total capacity of from 15- to 20-million kilowatts, the newspaper estimates, and will transform the area into a major iron and steel producer. Designs have been completed on the primary task of harnessing the rivers in the Amur basin, covering about 700,000 square miles.

Peking radio said in May the ministries of geology and the metallurgical industry are rushing "strong teams" of prospectors and surveyors out to western China "to investigate the deposits and provide adequate data for extraction to begin within one year."

The Chinese radio said the discovery of a big nickel ore deposit in Yunan province is the greatest this year.

Deposits of chromate ore discovered in the Inner Mongolian Autonomous Region, the Communists said, are many times bigger than the one discovered in Chinghai province in 1956.

Letters (*Continued*)

many foreign engineers who have visited us have been able to certify. I think if Mr. Deringer could revisit Catavi he would be pleasantly surprised.

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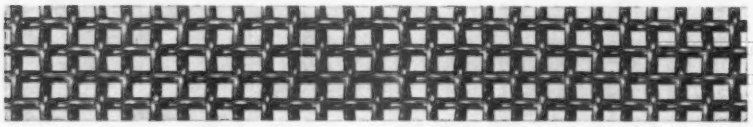
General Mechanical Superintendent
Corporacion Minera de Bolivia
La Paz, Bolivia

On page 204 of your issue for May 1958, a news item on the Neyveli lignite project starts with: "U.S. and German production know-how is being employed to mechanize a vast lignite mining proj-



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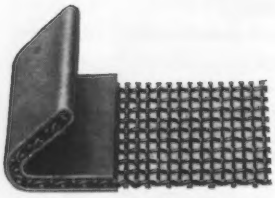

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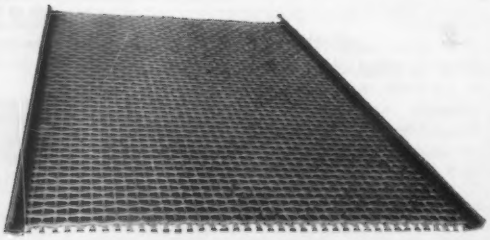

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ect at Neyveli, India." In point of fact this company, which is British, is acting as consultants to the project. . . . therefore, I think the "know-how" should be credited to us, though the manufacturing know-how belongs to the plant manufacturers, most of whom are German and British. The mine is a new project and has been planned to be as fully mechanized as possible from the very beginning.

D. G. Hemmant
Managing Director
Powell Duffryn Technical Services Ltd.
London, England

Correction: In its April issue, *E&MJ's* reference to David D. Baker's new position was incorrect. **David D. Baker** is head of a relatively new Production Evaluation Division. The "new concentrates procurement division" referred to is actually the former Concentrate Procurement Division which was changed to the new Source Materials Procurement Division, and is headed by C. E. Tonry, who also was director of the earlier concentrate division.

Personals *(Continued)*

Edward G. Gersich was made safety supervisor in Oliver Iron Mining's Hibbing-Chisholm district, succeeding Clarence E. Shea, retired. **Daniel G. Rukavina Jr.** succeeds Gersich as safety supervisor in the Canisteo district, where **Clifford M. Tinquist** has been promoted to safety engineer.

M. N. Osoko has been made general mine foreman at the Cerro de Pasco mine, Peru.

Marcel A. Cordovi has joined the Atomic Power Developments Section of International Nickel Co.'s development and research division. Previously with Babcock & Wilcox Co., New York, Mr. Cordovi has also been consultant in metallurgical engineering at the Brookhaven National Laboratory of the AEC.

Cordovi

Paul R. Brucker has been appointed to the newly created position of plant metallurgist for Crucible Steel Co.'s Midland Works. **Claude M. Sheridan** succeeds him as division metallurgist.

E. Austin was recently appointed general manager of Hudson Bay Mining & Smelting Co., Flin Flon, Manitoba.

Nelson Hogg, formerly resident geologist for Ontario Department of Mines, Porcupine area, chief geologist for Howe Sound Mining Co., Snow Lake division, and field geologist in the Toronto Exploration division has been appointed senior geologist for Hunting

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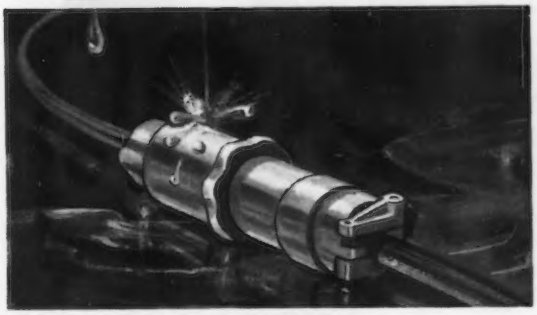

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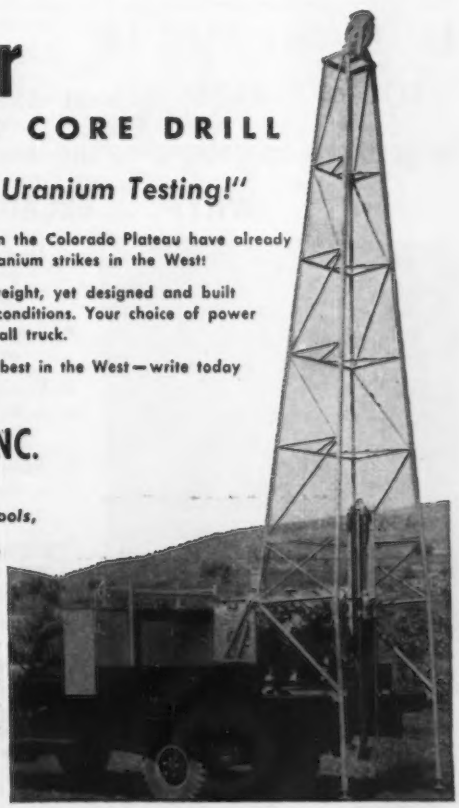

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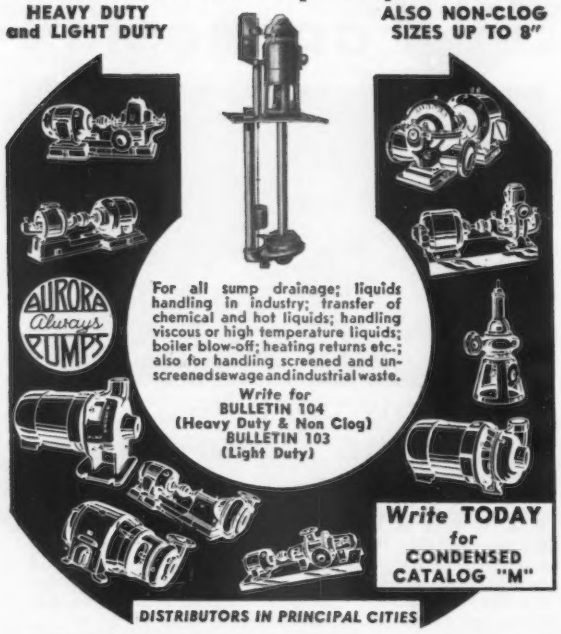

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Personals *(Continued)*

Technical & Exploration Services Ltd., Toronto.

Officers of Lake Superior Mines Safety Council elected recently are: president **H. D. Stott,** director of industrial and public relations, Calumet & Hecla Inc., Calumet, Mich.; vice president, **S. B. Slade,** safety inspector, Jones & Laughlin Steel Corp., Minnesota Ore division, Virginia, Minn.; secretary, **Allen D. Look,** district health and safety supervisor, USBM, Duluth, Minn.; treasurer, **A. J. Windl,** retired from Oglebay Norton & Co.

Nearly 200 persons were present May 17 at a testimonial dinner honoring **Prof. William I. Smyth** on the occasion of his retirement from 33 years of service to the Mackay School of Mines, University of Nevada, Reno. Professor Smyth is shown above receiving a replica of the John W. Mackay statue of the University, from **Dr. Vernon E. Scheid,** Dean of the Mackay School of Mines. The silver-plated statue, mounted on a base of Sierra Nevada granite, was a gift to Smyth from those who attended. The event was co-sponsored by the Nevada AIME Section and the Mackay School of Mines.

T. E. Rowbottom has joined Gypsum, Lime and Alabastine Canada Ltd., Toronto, as engineering geologist.

Alan J. W. Law, formerly with Geco Mines Ltd. is now with Milliken Lake Uranium Mines, Elliot Lake, Ont., as is **Edward W. Gibson** formerly at Silver Standard mine, Hazelton, B. C.

Robert J. Hendricks, formerly resident director and manager of Cyprus Mines Corp., Skouriotissa, Nicosia, Cyprus has been appointed vice president, with headquarters in Los Angeles.

J. B. Mitchell is now with the Panel mine, Northspan Uranium Mines Ltd., Elliot Lake, Ont.; he had resigned from Britannia Mining & Smelting Co. Ltd.

J. W. Peck succeeds **H. C. Hughes** as chief inspector of mines for British Columbia. Peck was formerly resident mining engineer for the Kootenays.

G. C. Campbell, formerly with Faraday Mines Ltd., Bancroft, Ont. is now with

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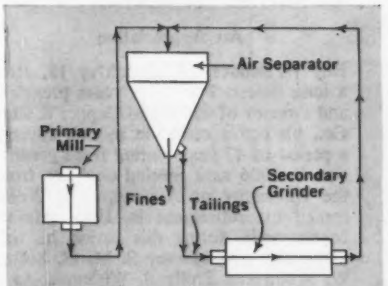

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Lorado Mines Ltd., Uranium City, Sask.

John Owens, formerly with M. A. Hanna Co. on the Cuyuna range, is now geologist for Ozark Ore Co., Ironton, Mo. **Larry Trost,** a recent University of Minnesota graduate, succeeds Owens.

Merlyn Woodle, Hibbing, Minn., has joined Reserve Mining Co. as assistant manager of the Babbitt division. Formerly acting manager of Liberia Mining Co. Ltd. Liberia, and superintendent of Republic Steel's Minnesota mines, Woodle has also worked in Arizona copper mines and bauxite mines in Arkansas.

John H. Stitzer has recently been made president of Stevens, Pafford and Associates of Tucson, Ariz., engaged in engineering, land surveying and photogrammetry. Mr. Stitzer is a registered professional engineer in Arizona and Minnesota, and a commissioned U. S. Land Surveyor. He holds a B.S. degree in mining engineering from New Mexico School of Mines, and has had 22 years' experience in open pit and underground mines in both metallics and nonmetallics.

Stitzer

R. D. Perry, vice president and general manager of Consolidated Mining & Smelting Co. of Canada Ltd., and **Robert Hendricks,** vice president in charge of sales, have been appointed directors.

Dr. A. E. Edwards was made director of research for Aluminium Laboratories Ltd., Montreal, to succeed **R. H. Rimmer,** vice president, who retired July 1.

W. P. Gillingham has resigned as mine superintendent for National Lead Co. at Baxter Springs, Kan., to join the mining division of Boyles Bros. Drilling Co., Salt Lake City.

Dr. John S. Rinehart, assistant director of Smithsonian Astrophysical Observatory and an astronomy research associate at Harvard University, will become a full professor of mining engineering at Colorado School of Mines next fall. He will also become director of the School's Mining Engineering Research Laboratory.

Ralph E. Schneider, assistant secretary and assistant treasurer of Anaconda Co. since 1947, has been elected secretary and treasurer, succeeding **C. Earle Moran,** who has retired. **Thomas E. Tatem** and **Frank M. Byrnes** replace Schneider, respectively, as assistant secretary and assistant treasurer.

Dr. John F. Thompson, chairman of the board of International Nickel Co. of Canada Ltd., has been awarded the Institution of Mining & Metallurgy's Gold Medal for 1957. Dr. Thompson received the medal at the Institution's annual general meeting in London on May 15.

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Personals *(Continued)*

Walter F. Dingley, assistant secretary of U.S. Borax & Chemical Corp., has retired after 41 years' service.

Dr. Robert O. Vernon of Tallahassee, has been appointed director of the Florida Geological Survey, succeeding Dr. Herman Gunter who retired. Dr. Vernon has been assistant for Dr. Gunter for several years and has been with the survey since 1941.

C. D. Clarke has been promoted to deputy manager of operations for Cerro de Pasco Corp., La Oroya, Peru. He was assistant to the manager of operations.

Dr. William E. Berthelf II has been appointed economic geologist of the State Institute of Mining and Technology, Socorro, N. M.

Richard C. Anderson has been promoted to position of mine superintendent of the Fresnillo Co.'s mine, Zacatecas, Mex.

A. V. Faull has been named superintendent of Crucible Steel Co. of America's recently acquired mine at Hugheston, near Charleston, W.Va. He had been superintendent of the Crucible mine (Pa.), of which **Frank A. Burns** has been named acting superintendent.

E. K. Barnes of Spokane, Wash., director of Sidney Mining Co., has been named vice president, filling the vacancy created by the late William A. Beaudry of Seattle. **Fred E. Marler Jr.,** of Kellogg, Idaho, was appointed to fill the vacancy on the board. He is also a director of Sunshine Consolidated and Big Creek Apex.

Obituaries *(Continued)*

An Appreciation

Roy W. Moore, 74, died May 18, after a long illness. For many years president and director of Coronado Copper & Zinc Co., his active career in mining covered a period of 47 years dating from graduation in 1906 as a mining engineer from the University of Arizona, until illness forced his retirement in 1953. Almost continuously during this period he was associated with Harvey S. Mudd, Seeley W. Mudd and Philip S. Wiseman. As a young man prior to 1913, he was employed as assayer, surveyor, churn drill helper and sampler at operations in Sonora, Mex.; Ray, Ariz., and Bryan Mound Sulphur in Texas, followed by mine examination work and later as superintendent and manager of Goodsprings Anchor Co. at Jean, Nev., until 1919.

An indefatigable and faithful worker, time was of small moment where problems of mining, milling, geology or just plain human beings were concerned.

Roy was a member of AIME and of Mining and Metallurgical Society of America.

An Appreciation

John Forsyth Miller, 81, a pioneer in the field of metallurgical technology, died at his home in Larchmont N. Y. April 12. Mr. Miller, an engineering graduate of A.C. College, Logan, Utah, in 1897, started his career with the Eureka Hill mine followed by a position as superintendent of the copper and lead refineries of the Canadian Smelting Works at Trail B. C., today the Consolidated Mining & Smelting Co. of Canada Ltd.

Among the many firsts to his credit was the work he had done in collaboration with Anson G. Betts, inventor of the process, in bringing into successful commercial operation the first electrolytic lead refinery, at Trail. His invention of the Miller Table did much to make the process practical. Another first was that of pumping molten lead, at the Trail refinery.

After 1917 he joined Broken Hill Pty. Ltd., Port Pirie, Australia, as a consulant in a modernization program at the smelter and refinery. Later he spent some time in French Indo-China in the service of the government as a consultant in a modernization program at the tin mines and smelter and over a year in Hong Kong in charge of revisions to the lead smelter. While in the employ of Hudson Bay Mining & Smelting Co. Ltd. as an engineer in 1929 at Winnipeg, he transferred to the Flin Flon mine site as chief designer. In this capacity another first to his credit was in the field of heavy machinery for mining operations—the first slusher hoists of 100 hp and up. He remained with Hudson Bay until his retirement in 1946.

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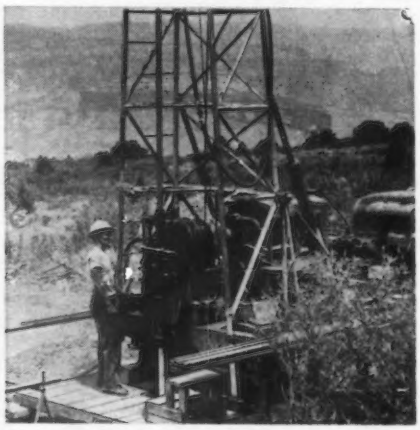

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1—5' x 10' Hendy Rod Mill

FLOTATION MACHINES
1—#7 Morse "Jetair" Hydra-cell, 22" x 22"
1—4-cell Morse-Weinig, 24" x 24"
1—2-cell Fagergren, 66"
1—4-cell Fagergren, 66"
1—8-cell Fagergren, 56"
1—2-cell Agitair #24
1—Denver unit cell #250
7—2-cell Fagergren, 62"

LOCOMOTIVES—DIESEL
1—2-ton Goodman Diesel, 18" ga.
1—4-ton Goodman Diesel, 18" ga.
1—6-ton Mancha Diesel, 24" ga.
1—Ruth Diesel, 24" ga.

LOCOMOTIVES—BATTERY
6—1½-ton Mancha "Little Trammers," 18" ga.
1—1½-ton General Electric Trammer
3—3½-4 ton Mancha Locomotives, Titan "A"
1—4 ton Westinghouse-Baldwin Locomotive
2—6 ton General Electric Locomotives
2—7 ton General Electric Locomotives
1—7 ton Atlas Locomotive
3—8 ton Ironton Locomotives
2—8 ton Goodman Locomotives
2—8 ton General Electric Locomotives
1—9 ton Whitcomb Locomotive
4—10 ton Atlas Locomotives

LOADERS
17—Eimco 12B, 18" ga.
8—Eimco 21, 18" & 24" ga.
3—Gardner-Denver Model 9, 18" ga.
1—Joy HL3, 18" ga.
1—Joy HL20, 24" ga.

AIR SLUSHER HOISTS
4—Ingersoll-Rand Model A5NNOH
1—Joy Model FF211
1—Ingersoll-Rand Model HNN-1J

AIR TUGGER HOISTS
2—Ingersoll-Rand Model D6U
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3—2" Galigher, Vac-Seal
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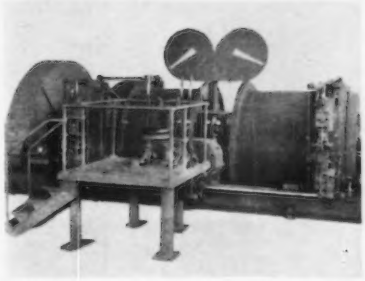

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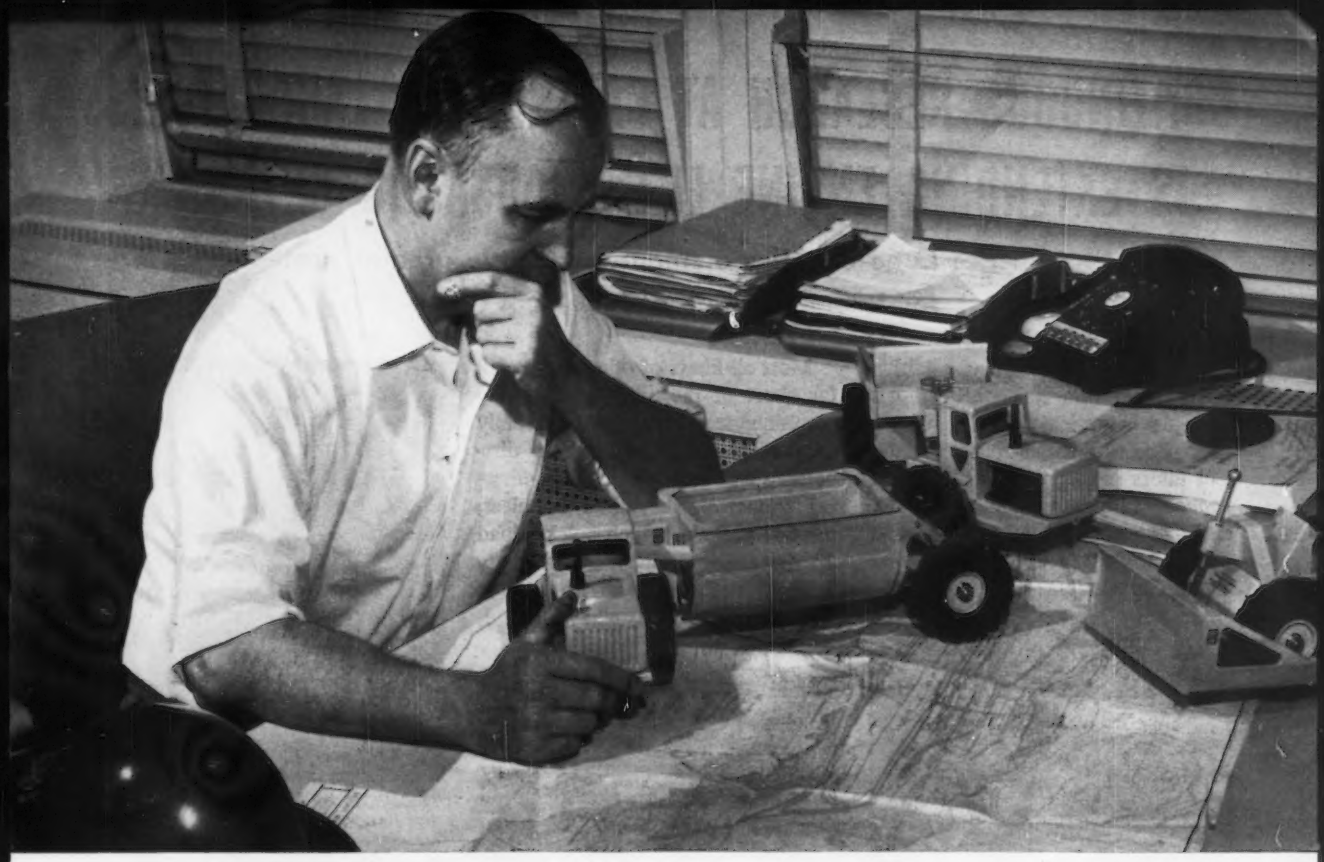

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For time-saving reference on where to get equipment, materials and services you need, consult the Guidebook's 43-page Buying Directory listing all known manufacturers of over 1,500 products. The industry's largest and most complete buying guide — full revised and up-dated for the 1958 issue — it's supplemented by detailed product data in manufacturers' advertising and listings of their sales offices nearest you.

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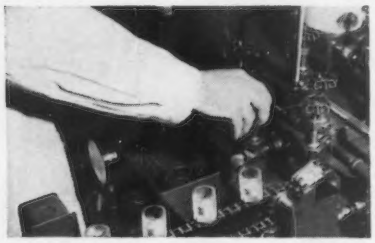
CONTINUOUS RESEARCH AT CATERPILLAR LABORATORIES IS EXTENDING ENGINE LIFE THOUSANDS OF HOURS

EXAMPLE: Lube oil filter elements that give greater protection for longer periods at less cost

The development of new, additive lubricating oils has reduced oil change requirements. Cat filters have kept pace with these improvements. Cat filters have greater *dirt-holding capacity* to filter efficiently over the entire *extended* periods. This means a big saving to every owner of Caterpillar equipment.

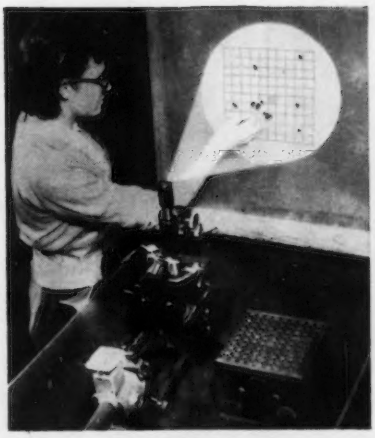


FILTER TEST STAND adds controlled amounts of dirt to lube oil to check how much dirt an element can hold before plugging. Unless this is determined, replacement recommendations cannot be made. Of all the filter makes tested, only Cat filters completely met Cat Engine requirements.

Most oil filters of other makes fall far short of meeting Cat filter replacement recommendations—usually because they have *insufficient* dirt-holding capacity (not enough filtering paper) or they filter harmless, too-fine particles which quickly load up the element, opening the safety bypass. As a result, unfiltered oil is allowed to circulate, causing rapid, premature wear.

You can't get maximum engine life unless you filter *full time*. The best way to insure long engine life, peak performance and operating economy is to standardize on Caterpillar oil filters. They are the only filters you can count on to give full-time protection over the entire filter change period that is recommended for your Caterpillar Engine. See your nearby Caterpillar Dealer today.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.



PROJECTION MICROSCOPE magnifies 500 times particles that pass through filter paper so they can be measured. Since precision bearings ride on an oil film, particles smaller than the oil film can cause no measurable wear even after thousands of operating hours. Too-fine filtering shortens filter life needlessly.

CATERPILLAR

Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

This contractor saved $1,822.24 in one year in oil changes

SERVICE TIP

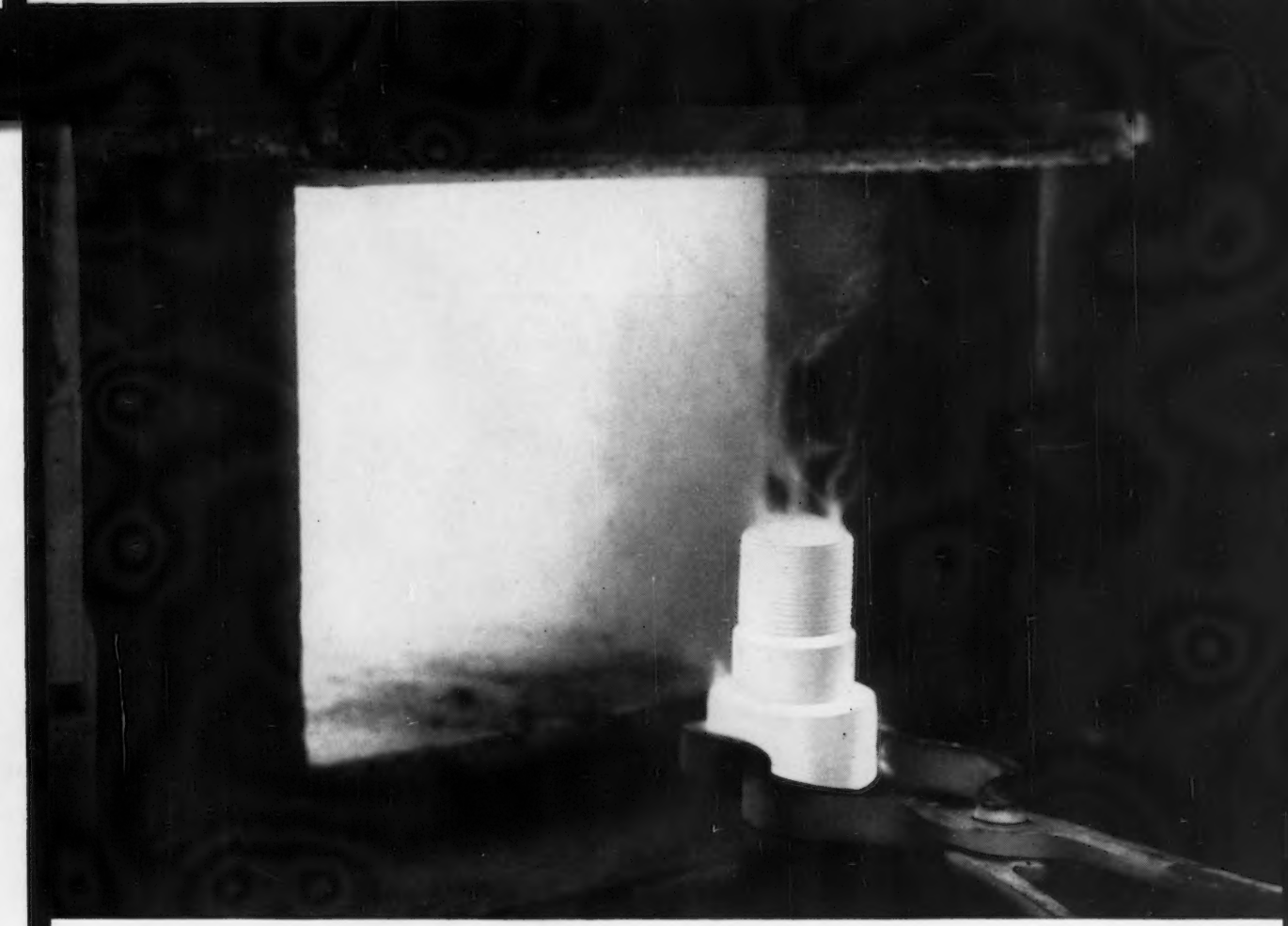
Complete information on oil changes is provided in Form 32421-1, *Crankcase Lubricating Oil Change Period Recommendations*, available from your Caterpillar Dealer. These recommendations are tested and proven. When used with Cat filter elements, you'll get maximum protection for your equipment at the lowest cost.

Many Caterpillar owners tend to play it safe by changing lube oil and filter elements far more frequently than recommended; thus they are willing to gamble on lower-priced, small-capacity filter elements. This is false economy. Here is an actual experience of a contractor, owner of eight Caterpillar D8 Tractors, who followed recommended procedure with Cat filters:

Past Procedure — Oil changed every 80 hours	
Lube oil @ $1.25 per gal.	
9 gal. per change	$11.25
[redacted] filters @ $1.00 ea.	
3 per oil change	3.00
Labor cost	2.50
Total cost per change	$16.75
Ave. operating hours per year	2,400
Ave. oil changes per year	30
Total cost per machine per year	$502.50
Total cost for eight D8s	$4,020.00

Cat Recommended Procedure — Oil changed every 150 hours	
Lube oil @ $1.25 per gal.	
9 gal. per change	$11.25
Caterpillar filters @ $1.14 ea.	
3 per oil change	3.42
Labor cost	2.50
Total cost per change	$17.17
Ave. operating hours per year	2,400
Ave. oil changes per year	16
Total cost per machine per year	$274.72
Total cost for eight D8s	$2,197.76

D8s — 2U, 14A and 15A Series Tractors · Lubricating oil used: Series III · Fuel sulphur content: .4% to 1.0%



Little Furnace
Makes Money for You

But for this little furnace you wouldn't be getting the irresistible cutting power or the footage or the diamond salvage that Truco Bits deliver today.

When our metallurgists developed our patented system for anchoring diamonds nearly twenty years ago, part of the secret lay in the sintering process by which diamonds were anchored in a solid, tough, metal bed which also developed a chemical bond with the diamonds and held them in a vise-like grip that was the wonder of the industry.

The sintering demanded precise control and these electric ovens were developed to sinter the powdered metal bed and bit blank into a solid amalgam without injuring the diamonds and without allowing them to move from their carefully set position, each with "best face to the work" for maximum cutting power.

Metals produced by this process cling to diamonds through toughest abrasive conditions and when the bit is finally pulled, there are more salvable diamonds there than you have any right to expect, except in a Truco.

That's one of the reasons why Truco Bits cost less. Try a Truco and see for yourself.

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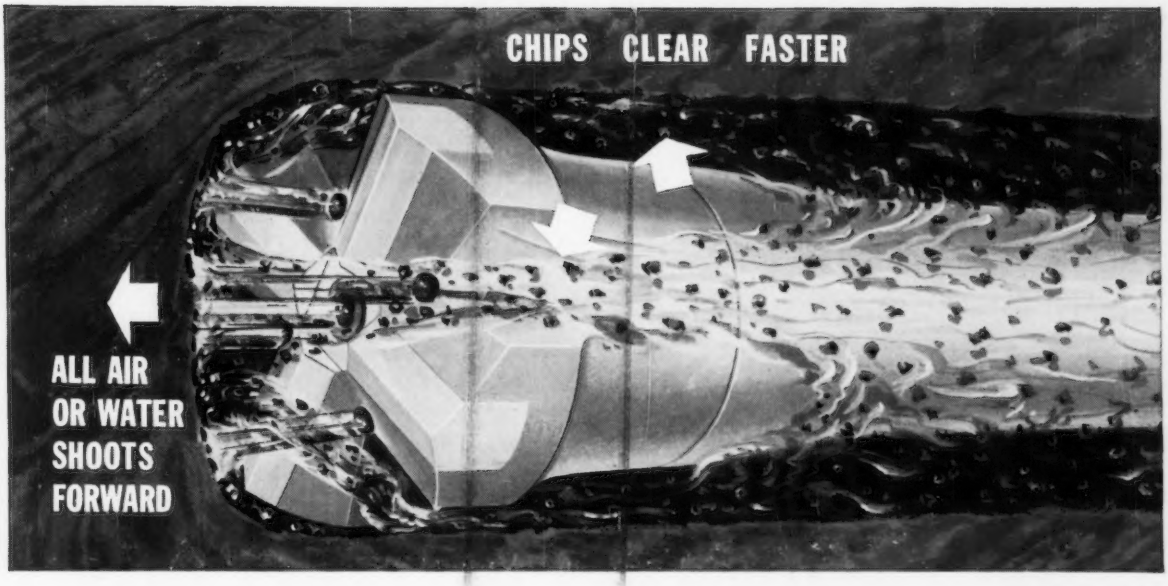

New TIMKEN® threaded bit speeds chip clearance on drifters, sinkers and stopers

THREE NEW FEATURES help you get more hole-per-bit with the new Timken threaded bit. 1) new five front holes and 2) wider wing clearance speed chip removal; and 3) new wear-resistant carbides give longer bit life.

The picture above shows how you can increase your hole-per-bit average on drifters, sinkers and stopers. The new Timken® threaded carbide bit clears chips faster. That's because 1) newly-positioned five front holes shoot air or water *directly* against the rock face; and 2) deeper, wider wing clearance lets chips wash back faster. Deeper relief under the heel provides an even freer passage. As a result, the bit spends less time "drilling" chips, more time drilling rock. Removing chips this faster way eliminates the problem of clogged drill steels, prevents damage to bit skirts.

And the new Timken threaded bit has new special analysis carbides that give increased resistance to wear and shock. They can be reconditioned many times. Redesigned, heavier wing helps speed drilling. And improved thread contact reduces breakage to a minimum.

To get more hole-per-bit, use the new Timken threaded carbide bit. For more details, send for free brochure. The Timken Roller Bearing Company, Rock Bit Division, Canton 6, O. Cable: "TIMROSCO".

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